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Designing effective leadership capacity development programs for women agricultural researchers in Africa

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Abstract

African women scientists face complex workplace and socio-cultural barriers in their quest to advance to top positions. The African Women in Agricultural Research and Development program executed a tailored leadership development program to empower women scientists through enhancing their knowledge of organizational contexts, skills in negotiation, collaboration, conflict management, and leadership. This study presents a mixed-methods evaluation of the effectiveness of the program. Results from the analysis show that the program is particularly effective in improving the capacity of participants to present themselves confidently and professionally, to access and leverage networks effectively and to mentor other scientists. Eighty-four percent of fellows had triangulated evidence (from qualitative and quantitative data) of change in their leadership capacity. The program played a central role in effecting these changes for 81 percent of fellows. The article concludes with recommendations for the design of leadership development programs for female scientists.

Keywords: Leadership, capacity, African women scientists, gender, gender parity, agricultural research and development

Introduction

Although the number of women in science is growing, globally women are still underrepresented in the scientific professions, especially in leadership roles (Hill, Corbett and Rose, 2010; McCullough, 2011). This trend is especially evident in African agricultural research. Data confirms that one in four African agricultural research and development scientists is female, while only one in seven senior leaders in agricultural research and development institutions is female (Beintema and Stads, 2006).

Having low representation of women leaders in agricultural research has negative consequences; it undermines effectiveness of agricultural research and limits innovation potential (Duran and Lopez, 2015; Hewlett, Marshall and Sherbin, 2013). Research shows that there are variations in men and women farmers' trait preferences for the same crop (Andres, 2011). For instance, while men may be interested primarily in crop yield potential, women may be interested in varieties that score highly in desirable cooking qualities such as amount of water and fuel needed, nutrition profile, and cultural value (Beintema and Stads, 2006). If there are inadequate numbers of female scientists, then critical inputs into meeting the specific needs of women smallholder farmers will be missing (Andres, 2011; Beintema and Stads, 2006). This is a highly undesirable situation given that women comprise on average 43 percent of the agricultural labor force in developing countries, and over 50 percent in parts of Africa (FAO, 2017). Furthermore, women scientists are lacking in key positions where they can influence agricultural policy, decision

making at institutional and national levels, and serve as role models to girls and young women aspiring for careers in agricultural research and development (Andres, 2011). Increasing the contributions and leadership of women researchers in Africa's agricultural research and development will prevent the waste associated with not fully utilizing their insights, experience, and technical capabilities (Andres, 2011).

Increasing the number of women in leadership within agricultural research institutes presents several challenges. Some of these challenges are also experienced by women more broadly in the world of work. Three perspectives may be used to review the specific challenges women experience in their climb to the top rungs in their career ladders. These are the 'leaky pipeline', 'glass ceiling' and 'labyrinth' respectively (Blickenstaff, 2006; Eagly and Carli, 2007). According to the 'leaky pipeline' metaphor, both men and women join the science, technology, engineering, and math (STEM) career pipeline, and they progressively drop out ('leak') out of the pipeline. Cronin and Roger (1999) found the absence of women in STEM to be both progressive (the further along the pipeline, the fewer women you find) and persistent (the problem has not gone away in spite of interventions). The most well-known view has been that women's career aspirations are stopped by a 'glass ceiling' – a metaphor that describes a subtle yet strong barrier that prevents women from moving up the corporate hierarchy, however Eagly and Carli (2007) propose a different perspective, that of a labyrinth, which conveys the idea of women's complex journey towards a worthy goal through a passage that is neither simple nor direct, but that "requires persistence, awareness of one's progress, and a careful analysis of the puzzles that lie ahead". Because all labyrinths have a viable route to the center, it is understood that goals are attainable. The metaphor acknowledges obstacles but is not ultimately discouraging. This shift recognizes the fact that women are kept from advancing in their careers at all levels; not just when they get to the top, and that individual and institutional factors that contribute to this exist.

Research has attempted to document these barriers to advancement in the sciences, and has identified that they include the demands of family life; inadequate social capital; gendered expectations on leadership style; existing prejudices as well as practices against women in the work place related to pay and promotions (Eagly and Carli, 2007).

However, not all the barriers to advancement are faced exclusively by women. In agricultural research and development organizations, scientists are promoted to senior leadership based largely on technical competence, though they may be lacking in people leadership and managerial skills, the so-called "soft skills" (Goh *et al.*, 2008). In these roles, they face the challenge of transitioning from a technical expert to becoming a leader (Andres, 2011; Sheridan, 1998). The unfamiliar territory may have negative consequences for them at organizational and personal levels. Although not unique to women, the impact is greater on female scientists than male scientists (Andres, 2011). To operate effectively at these senior levels, leaders need to draw on the non-technical skills (soft skills) that are required to motivate teams, communicate strategy and direction, manage complexity, and lead change. These skills include, but are not limited to, self-awareness, self-regulation, motivation, empathy, social skills, professionalism, flexibility, teamwork, networking, negotiating, and mentoring (Goleman, 1998; Robles, 2012; Lussier and Achua, 2012). This underlines the need for soft-skills management training for women scientists in particular (Andres, 2011).

Women scientists in Africa are very diverse in their backgrounds, professional contexts,

personalities and experiences, knowledge and skills, their approaches to their work, and their work-life balance (Beintema and Di Marcantonio, 2009). This diversity calls for the design of effective yet tailored capacity-building programs to ensure that women scientists benefit fully. Typically, training sessions conducted by African agricultural research institutes miss the critical range of diverse perspectives necessary to develop appropriate leadership skills in women scientists needed to strengthen their organizational management capabilities (Beintema and Di Marcantonio, 2009).

Very little literature has been published documenting and describing the components of successful leadership development programs, particularly in the African agricultural research context. This paper contributes to the field of knowledge by describing the design of a tailored leadership development program for African female agricultural scientists and documenting success factors.

Developing a tailored leadership development program for female scientists

The African Women in Agricultural Research and Development (AWARD) program was conceptually designed based on a portfolio of successful activities initiated and managed by the former Gender and Diversity Program of the Consultative Group for International Agricultural Research (CGIAR). The Gender and Diversity Program program, in force from 1999 until 2012, helped the CGIAR Centers leverage their rich staff diversity to increase their research and management excellence, and to integrate gender and diversity issues into the organizations' activities, policies and programs. The program piloted and managed several successful initiatives including formal mentoring programs within the CGIAR centers and leadership training workshops for women scientists and professionals at CGIAR and partner institutions (Debre and the Center for Gender in Organizations, 2007).

The Gender and Diversity Program also established a pilot fellowship program for women crop scientists in three East African countries (Goh *et al.*, 2008) and conducted a comparative evaluation with the United States Agency for International Development (USAID)/United States Department of Agriculture (USDA)'s Norman E. Borlaug International Agricultural Science and Technology Fellows' Program for Women in Science (Ofir, van Wyk and Etta, 2008). Valuable lessons were gleaned from this comparison, including that within agricultural research and development organisations women aspire to leadership positions, but need more access to career-development opportunities to realize their aspirations, they often lack opportunities for wider collaboration and would benefit from a strong community of peers. The study also determined that women are most effectively empowered through a combination of mentoring, leadership development and science skills development.

Taking the above into account, AWARD designed a custom-made two-year career development program based on the content of these well-vetted set of activities. The program is a three-component initiative comprised of science, mentoring, and leadership development – whose combined impact on the individual helps them to advance their careers.

A framework for understanding leadership

AWARD's African Women in Science Empowerment (AWSEM) framework, which is directly linked to the program's theory of change, identified five types of empowerment needed for female agricultural researchers. The five types of empowerment are referred to as "Powers", each of which is illustrated in Table 1.

Table 1: AWARD's African women in science empowerment framework

Powers	Power subdomains
Power from Within	<ul style="list-style-type: none"> • Self-confidence • Self-knowledge • Motivation • Vision and direction
Power to Do	<p>Access to</p> <ul style="list-style-type: none"> • Knowledge and information • Opportunities • Contacts and networks <p>Leadership capacities</p> <ul style="list-style-type: none"> • Present oneself professionally • Manage diversity • Leverage team talents • Formally mentor others • Negotiate • Network <p>Scientific capacities</p> <ul style="list-style-type: none"> • To conduct research • To conduct gender-responsive research • To fundraise • To present (work or research)
Power Over	<ul style="list-style-type: none"> • Career Progress, including promotions and education achievements • Visibility • Professional Recognition, including professional awards, invitations and additional bursaries/fellowships
Power With	<ul style="list-style-type: none"> • Participating in collaborative activities • Leading collaborative activities
Power to Empower	<ul style="list-style-type: none"> • Efforts to raise awareness of gender responsive research & development • Strengthen capacities around gender responsive research & development • Influence on norms, policies and strategies for gender responsive research & development

The theory of change postulates that if high-quality candidates are found and implementation is of high quality, the opportunities provided through the three components will help the fellows gain skills and access to resources and networks, which in turn will help them to demonstrate growing confidence and assertiveness; the motivation to lead, excel and contribute; have a personal impact; develop competence (including being gender-responsive); and raise creativity and visibility.

The leadership component falls under the “Power to Do” in the framework. Leadership development complements science skills development and mentoring to form a holistic package of empowerment experiences that together are expected to elicit higher outcomes including, fellows increasingly serving in leadership roles and demonstrating leadership in their research endeavours. According to the theory of change, after going through the leadership training, fellows should have increased self-awareness and understanding of their leadership potential; improved leadership and management skills and insights; enhanced confidence in their leadership abilities and the motivation to practice them; and improved visibility as role models. These skills are vital for creating and leading the organizational and societal change required to improve the working conditions of women scientists and dramatically improve their chances of becoming senior leaders in agricultural research and development systems.

Leadership development

Recognizing that women need greater recognition for and encouragement of their leadership, the training for women’s leadership skills is tailored to the specific needs of women in science. The specific outcomes of the leadership courses are that fellows learn to network effectively, present themselves professionally, navigate organizational diversity, leverage team talents, manage conflicts, and negotiate. Building on the programs approach to empowerment, one of the outcomes of the leadership capacity development is the increased capacity of fellows to mentor other scientists. Full details on the leadership courses can be found on the fellowship’s website (AWARD, 2017). A summary of each of the courses and their main objectives are given below.

Leadership skills course is aimed at strengthening the leadership capacity of fellows with bachelor’s degrees by building fellows’ self-esteem and confidence, enhancing their ability to work in a team and manage conflict, improving their active listening skills, their abilities to give and receive feedback, their assertiveness, negotiation skills, presentation skills, and time management skills.

Women’s leadership and management course is designed to address the challenges and opportunities of African women with postgraduate degrees by empowering them to build and sustain team performance, communicate effectively for facilitation and feedback, manage interpersonal conflict, create alliances and leverage diversity, and deal with gender issues in the workplace.

Enhancing negotiation skills for women course is aimed at helping fellows recognize what is on the table during negotiations. This course teaches fellows to recognize the hidden contexts, barriers, opportunities and gender undertones during negotiations, assess their own bargaining strengths and weaknesses and identify strategies that will position them as effective negotiators.

Role modelling events require fellows to practice their newly acquired leadership skills by organizing a role modeling event in which they step up as visible and confident female

researchers in their communities or work environments, with the aim of encouraging more women and girls to pursue careers in agricultural research and development.

Methodology

Data was collected through the fellowship's monitoring and evaluation efforts. The objective was to determine the effectiveness of the leadership program and the extent to which fellows gain the range of leadership skills envisioned in the program design. A well-structured data collection process was used to determine the degree to which (if at all) the program contributes to the desired outcomes.

The following outcomes related to leadership were assessed:

- Capacity to present oneself professionally
- Capacity to navigate diversities in the workplace effectively; specifically, cultural, personality, and gender diversities
- Capacity to leverage team talents by drawing on the unique strengths of others
- Capacity to negotiate for a desired outcome in one's professional environment
- Capacity to network effectively by communicating with relevant and influential persons in one's professional field for targeted purposes
- Capacity to formally mentor others

Data sources

The findings discussed in this article are based on data collected from fellows by an independent contractor. Final evaluation forms were distributed to fellows at the end of the two-year fellowship via the online survey software program, QuestionPro. The software allowed for the online completion of the evaluation forms by the fellows, and allowed the data to be directly downloaded from the online platform, ensuring data quality and integrity. To make triangulation between multiple datasets possible, data collection was not anonymous, although all data were treated with the strictest confidence.

Specifically, data discussed were collected from two groups of fellows, namely the 2013 cohort and the 2014 cohort. A response rate of 88 percent (122 fellows) was obtained, with highly similar response rates noted between the two cohorts. Response rates higher than 90 percent were obtained in groups of fellows with masters and doctoral fellows, with a lower response rate of 76 percent among the post- bachelor's fellows.

Data collection instruments

In order to assess change in the leadership capacities outcomes, as well as the fellowship's contribution, fellows were asked to complete an evaluation questionnaire consisting of quantitative and qualitative questions measuring each of the outcomes. Quantitative questions measuring change asked fellows to rate themselves on each component of the leadership capacities dimension at the start and at the end of the fellowship on a scale ranging from 'Very Low' capacity to 'Very High' capacity. This approach allowed for individual level change to be

calculated for each fellow on each of the leadership component outcomes.

While quantitative questions asked fellows to rate themselves before and after the fellowship on each dimension of the sub-domain in question, a single qualitative question was presented to fellows after the series of quantitative questions, and did not prompt fellows to describe changes in all the aspects of leadership. Rather, fellows were asked to report on the most important changes that they have experienced and to provide concrete examples illustrating these changes.

In addition, one quantitative question allowed for the strength of the fellowship's contribution to leadership capacity enhancement be identified by asking fellows to indicate the extent to which the program was a factor in bringing about any changes in their leadership capacity. Response options ranged from 'No Factor' to 'Major Positive Factor'.

A follow-up qualitative question asked fellows to reflect on the role that the fellowship played in bringing about the changes. Fellows were asked to describe specific activities that led to change and to explain how these activities enabled or contributed to the changes that they experienced.

Data analysis

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS). Data transformations were carried out to compare fellows' *start* and *end* of fellowship assessments of their progress made on each of the leadership outcomes. Based on these data transformations, the number of fellows who reported change on a particular outcome could be determined and the scale of change identified (for example from 'Very Low' to 'Very High'). Further transformation was carried out to create a single variable depicting the total number of leadership outcomes where change was reported for each fellow. Descriptive statistics in the form of a frequency table were run on this final transformed variable to determine the number of fellows who showed change on a particular number of outcomes. A frequency table was also run for the quantitative question on the fellowship's contribution to change, providing a summary of fellows' ratings of this contribution on their leadership capacity.

Deductive qualitative coding was done using Dedoose (2017), an online mixed-methods data analysis tool. Qualitative stories of change in leadership (see Table 1) were deductively coded and rated in terms of their credibility as either lackluster, convincing, or compelling. Detailed code descriptions were agreed upon to improve consistency in the coding process. Data were coded by a small team of researchers, all of whom have been engaged with the program for at least three to five years. Resource constraints limited the extent to which all coded excerpts could be verified by a second researcher. However, 10-15 percent of excerpts were selected for verification. The combination of convincing and compelling stories was counted as credible evidence of change. Fellows who had credible evidence in their descriptive stories were considered to have qualitative evidence of change for that particular outcome and were included in the integrated mixed-methods analysis. Fellows with lackluster evidence of change were considered to have no qualitative evidence of change.

Fellows were also asked to reflect on the contribution of the fellowship to the change they experienced in terms of their leadership capacity through a qualitative question. This open-ended question asked fellows to reflect specifically on how the program facilitated change through describing activities or processes in the fellowship. In addition, qualitative coded responses were

quantified to identify the program activities which made the strongest contribution to change.

Using the Dedoose mixed-methods analysis tools, code application data at the individual fellow level was exported from Dedoose into Excel for purposes of integration with the quantitative data.

Triangulating AWARD's contribution to change

Triangulated change for leadership was determined by matching the quantitative change a fellow to their qualitative data. Change was considered triangulated if quantitative change and a credible story were both found. An overall index of triangulated change in the Leadership dimension was then determined by denoting all fellows who showed triangulated change on at least one of the outcomes as having “*triangulated evidence of change in leadership*”, and all fellows who did not show triangulated change on any of the sub-dimensions as having “*no triangulated evidence of change in leadership*”.

A similar approach was taken when triangulating AWARD's contribution to change. Quantitative and qualitative responses were triangulated to verify the strength of the fellowship's contribution. If a fellow indicated that the fellowship had played a role in their quantitative response and had written a feasible narrative in their qualitative response, that contribution to change was considered verified.

Results

Leadership outcomes

As discussed in the methodology, fellows were asked to report changes in their capacities related to the capacity to present themselves professionally, to navigate diversities in the workplace, to leverage team talents, to negotiate, and to mentor in *qualitative and quantitative* questions.

Figure 1 illustrates the number of quantitative changes fellows reported. The majority of fellows had evidence for change in either five (45 percent) or all six (48 percent) of the outcomes. No clear differences were noted between fellows with different levels of qualification in terms of the number of outcomes where change was reported.

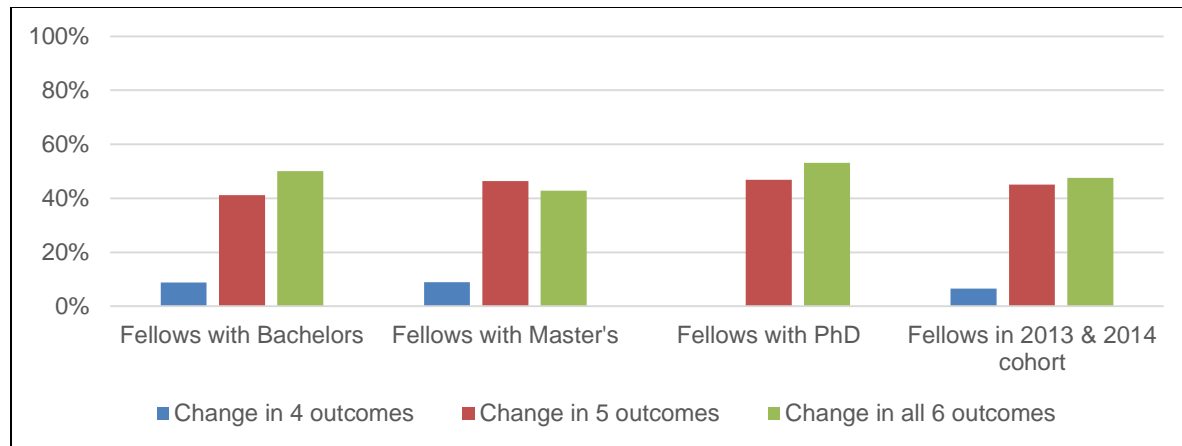


Figure 1: Percentage of fellows with quantitative evidence of change on the leadership outcomes

The changes across these outcomes is confirmed by the qualitative data. The capacity to present themselves confidently and professionally, and mentor others were the two most salient changes noted. Qualitative data (illustrated in Figure 2) showed that half of the fellows had credible evidence to support the changes they experienced related to their capacity to present themselves professionally and appropriately in the work context. Approximately one in four had credible qualitative evidence to support the changes they experienced with regards to their capacity to mentor others. Given that the qualitative questions did not prompt fellows to describe changes with respect to all outcomes, but rather were asked to report on the most important changes they have experienced, this distribution of qualitative evidence supports the fact that the design of the leadership component to address a range of science outcomes was an appropriate choice.

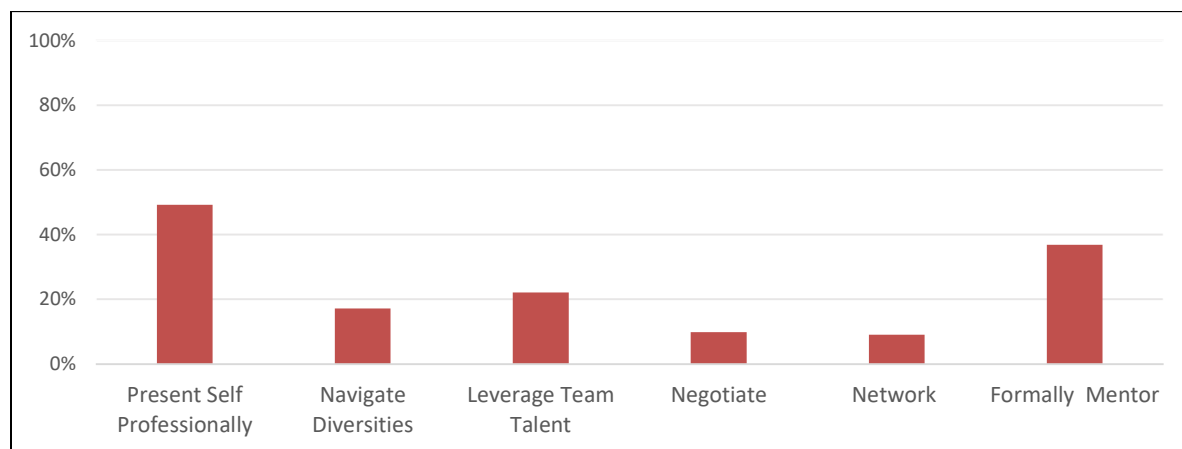


Figure 2: Percentage of fellows whose qualitative stories provided credible evidence for each leadership outcome

Triangulated results, combining quantitative evidence of change with credible qualitative stories showed that the vast majority of fellows (84 percent) had triangulated evidence for change in

their leadership capacity. There was no difference in the triangulated data between fellows who have different levels of qualification, suggesting that the regardless of qualification the bouquet of fellowship activities work together to develop leadership capacity for fellows.

Each of the six specific outcomes is discussed in greater detail below.

Presenting oneself professionally

Evidence shows women are less self-assured than men in the workplace —and that to succeed, confidence works in conjunction with competence. Research has also found that this lower self-confidence holds true even in prestigious academic institutions (Srivastava, 2015) and at the highest ranks of academia (Sarsons and Xu, 2015). The ability to present oneself professionally and confidently is therefore an important component of empowering women to lead.

Based on quantitative ratings, only five percent of fellows reported “high” levels of the capacity to present themselves professionally at the start of the fellowship; this shifted to 97 percent, indicating they had “high” to “very high” levels of the capacity to present themselves professionally after the fellowship period.

Almost all fellows (99 percent) reported an increase in their level of empowerment for this leadership outcome during the fellowship. The distribution of ratings before and after the fellowship is shown in Figure 3.

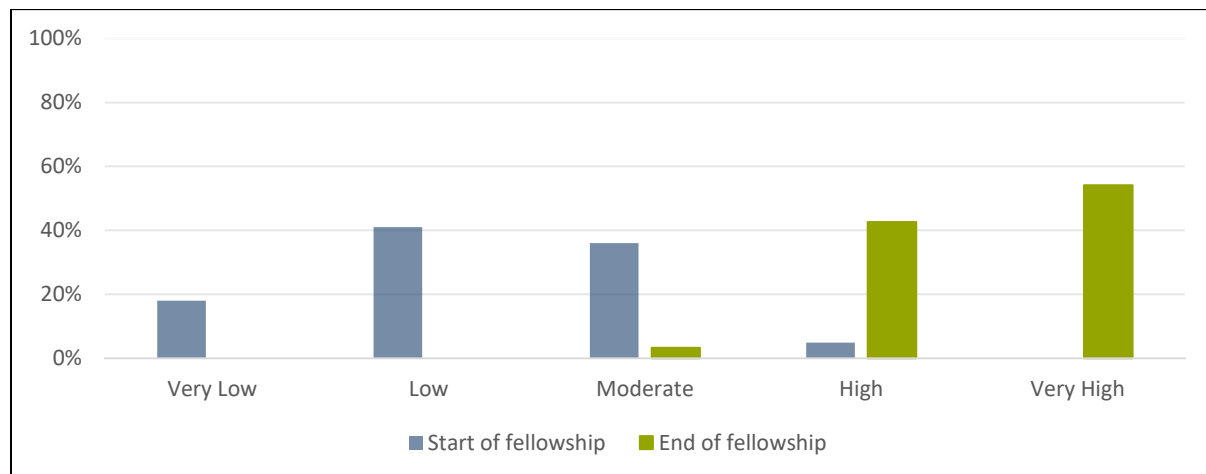


Figure 3: Ratings for ability to present oneself professionally before and after the fellowship

In terms of their capacity to present themselves professionally, 49 percent of fellows provided stories deemed as credible qualitative evidence of change (illustrated in Figure 2), for example:

“AWARD chose me to represent them at the world food Prize event in 2014 and the communications manager at AWARD helped me a lot in enhancing my communication skills. I was able to submit a commentary which was published in the Chicago council blog”(2014 cohort, fellow with a master’s degree, questionnaire/ feedback form, 2015).

When teaching at the University, most students have been commenting on my good style of teaching-asking open ended questions to engage students in class discussions, been open minded whereby I have been letting the students to contribute by bringing in new ideas. Winning an Advanced Science Training course led me to give two internal seminars in the company and representing AWARD and my University and Africa at large in hunger solution meetings. During this time, many people liked my presentations and oral communication or the way I answered questions and bringing in new ideas. I started receiving invitations to give speech on my life experiences in Africa to women in innovation and also gave ideas on how to keep girls in high schools and how to encourage girls to take hard subjects in Kenya. After several talks/ or presentations I was able to give speech without use of power point and also my communication improved. This is the time I felt more empowered whereby my confidence increased to be able to talk to many people of different races and backgrounds.”(2014 cohort, fellow with a master’s degree, questionnaire/ feedback form, 2015).

Access to network and capacity to leverage networks effectively

Increased connection to a wider network of collaborators and community of peers has been identified as one of the needs among women in African agricultural research (Debre and the Center for Gender in Organizations, 2007). Improved collaboration for science is also a global issue for female researchers – the Elsevier, (2017) found that across 27 countries women are less likely than men to collaboratively publish internationally, limiting their academic impact.

The fellowship provides a number of opportunities for fellows to foster their networking skills (through formal leadership training), and to develop networks (through membership to professional associations, sponsored conference attendance and regional network meetings). The goal of this mix of activities is to increase access to networks and the capacity to leverage these networks for professional goals.

Based on quantitative ratings, only 2 percent of fellows indicated they had high levels of access to professional networks prior to the fellowship, whilst after the fellowship 91 percent reported that they had high or very high levels of access to networks. In a similar trend, only nine percent of fellows had “high” levels of capacity to leverage their network effectively at the start of the fellowship; this shifted to 92 percent, indicating they had “high” to “very high” levels after the fellowship period.

As many as 98 percent of fellows indicated that they increased their access to networks through the fellowship, and 96 percent of fellows indicated an increase in their ability to leverage these networks effectively. The distribution of ratings for fellows’ capacity to leverage networks before and after the fellowship is shown in Figure 4.

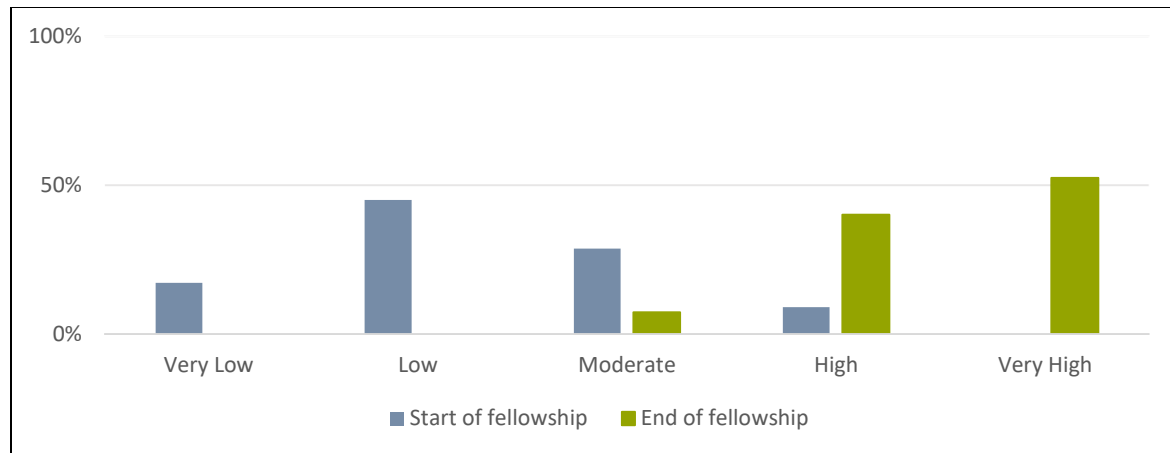


Figure 4: Ratings for ability to leverage networks before and after the fellowship

In terms of their access to professional networks, 90 percent of fellows provided evidence in their qualitative data to demonstrate their increased access. With regards to the capacity to leverage networks, 9 percent of fellows provided stories deemed as credible qualitative evidence of change. Examples are:

“Since I joined AWARD I’ve been able to expand my linkages through my close association with my mentor. Some of the activities I got involved in including writing research grants and organizing scientific conferences a result of the contacts made through my mentor”(2014 cohort, fellows with a doctoral degree questionnaire/ feedback form, 2015).

“I have a wider network involving fellows, mentors and some AWARD trainers. I can write proposals better. I am also currently working with my mentor and other collaborators on a project funded by DANIDA.” (2014 cohort, fellows with a doctoral degree, questionnaire/ feedback form, 2015).

“During the MOW in 2013, I met a senior from IITA who was mentoring a fellow. He is a nematologist. I only used to read about him in papers and publications. Therefore, when I developed an interest in plant parasitic nematodes, I really needed to meet someone who is experienced in this area. He has been such great help and if it were not for AWARD I probably wouldn’t have met him. I got my initial nematode cultures from his project, I got my training through his contacts. He has given me several books to read. I attended the International Congress of Nematology in South Africa where he introduced me to more of his nematology contacts. I have a bigger network now.”(2014 cohort, fellows with a doctoral degree questionnaire/ feedback form, 2015).

Mentoring capacity

Formal mentoring has become increasingly recognized as an important tool in capacity development and career advancement for minority groups, including women (Goh *et al.*, 2008; Willemsen, 2016). Capacity to mentor is thus a way for female scientists who are themselves rising in their careers to empower other female scientists in their direct environment to build a strong corps of women in leadership. The program thus not only provided each fellow with a mentor, but also equipped fellows to mentor others.

Based on quantitative ratings, only seven percent of fellows had “high” levels of formal mentoring capacity at the start of the fellowship; this shifted to 96 percent, indicating they had “high” to “very high” levels after the fellowship period. Almost all fellows (99 percent) increased their capacity to mentor.

A set of follow-up quantitative questions was presented to fellows to unpack any behavioral changes that emerged as a result of their increased capacity to mentor (see Figure 5). The data shows that not only have fellows’ capacity for mentorship improved, but that a substantial proportion (89 percent) are now formally mentoring other scientists. This is in sharp contrast to the 14 percent who did so prior to the fellowship. In addition to this, half of the fellows have contributed to the development of mentoring programs within their networks during the fellowship.

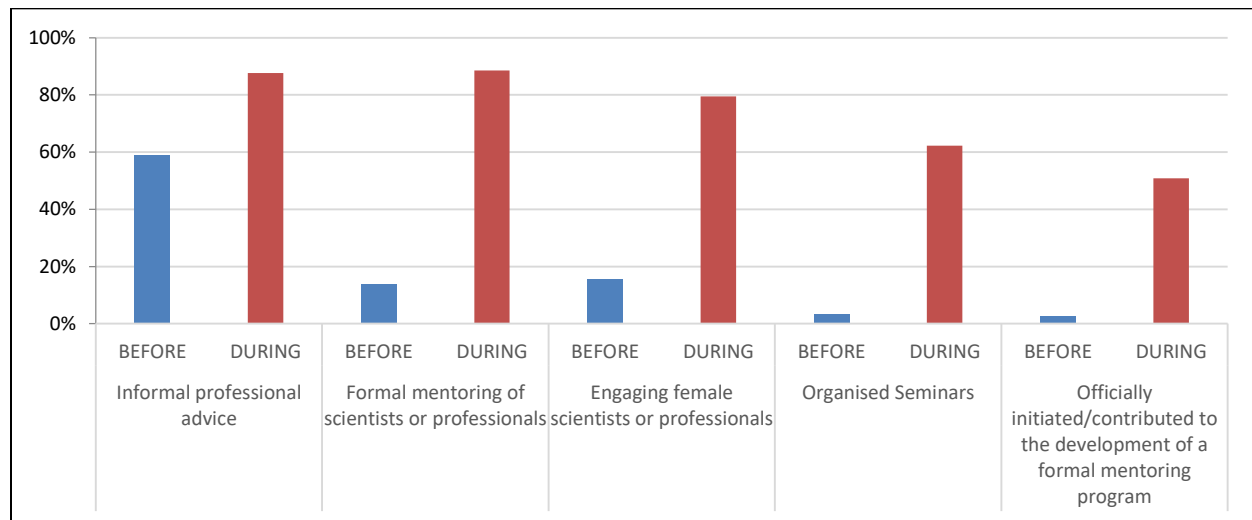


Figure 5: Change in mentoring activities during the fellowship

In terms of their capacity to mentor, 37 percent of fellows provided stories deemed as credible qualitative evidence of change (illustrated in Figure 2), for example:

“I recruited 4 staff (2 women, 2 men) on my project between May-Oct 2014 and have been mentoring these using the same skills acquired from the AWARD training. I encouraged them to negotiate with HR for their pay, and once on board started on a journey of aligning them to the project outcomes and roles of their respective positions. I have been meeting them individually to discuss their performance, the need to own and talk about their work, become visible and how they should operate under supervision.”

The two ladies are on top of things; one was slow and lacked confidence. She now takes full charge of her roles, has become significantly visible to the extent that my supervisor who used to ask about 'the extent she delivers on her work' appreciates her M&E role on the project. The other one had no previous work experience but was confident. With this mentoring she has become shrewd now, can independently make appointments and talk to high level personnel in government offices as well as steer a partners meeting. Other staff come to me for counseling, guidance and conflict resolution and I constantly draw from the skills to address such issues.

Navigating workplace diversities and leveraging team strengths

Despite the recognized value of diversity in stimulating innovation (Duran and Lopez, 2015; Hewlett, Marshall and Sherbin, 2013), diversity of gender, culture and personality present numerous challenges in the workplace. The capacity to manage diversity effectively and leverage team talents within diverse environments will continue to be a core competency required by all leaders which requires a combination of intrapersonal understanding (knowledge of oneself), as well as interpersonal understanding (knowledge of how to work with others). The fellowship activities were designed to address both the intrapersonal and the interpersonal.

Based on quantitative ratings, only eight percent of fellows had “high” levels of the capacity to navigate workplace diversities at the start of the fellowship; this shifted to 92 percent, indicating they had “high” to “very high” levels after the fellowship period. Almost all fellows (97 percent) indicated changes in their ability to navigate workplace diversities. The distribution of ratings before and after the fellowship is shown in Figure 6.

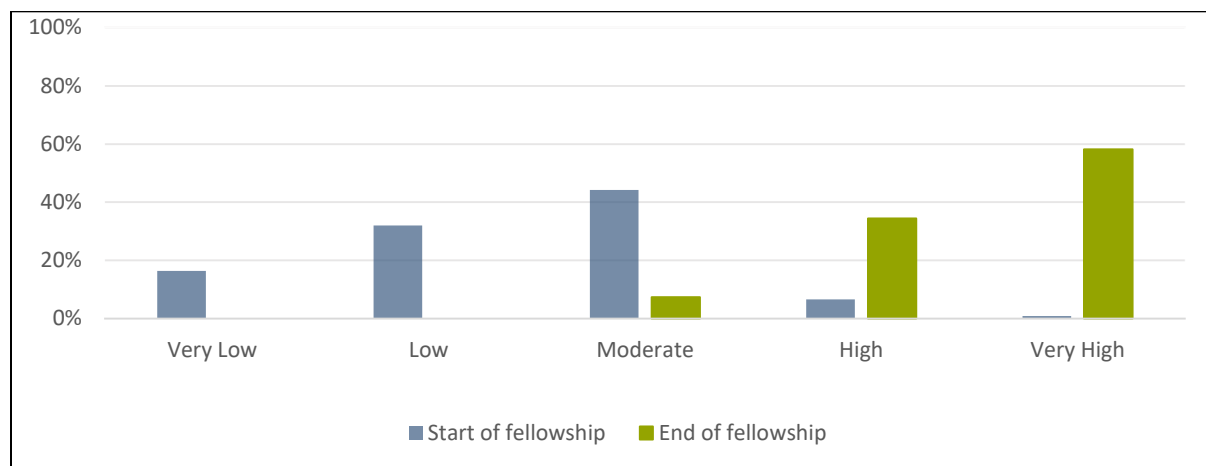


Figure 6: Ratings for ability to navigate workplace diversities before and after the fellowship

Seventeen percent of fellows provided stories deemed as credible qualitative evidence of change (illustrated in Figure 2), for example:

“In the course of my AWARD fellowship, I was appointed the Linkage program, environmental research and development (LIPERD) Director under the office of the Vice Chancellor. The AWARD fellowship gave me the capacity to lead both male and female staff effectively. The impact of the AWARD fellowship training to study and understand character, taught at the beginning of the fellowship was a major factor.”(2013 cohort, fellow with a doctoral degree, questionnaire/ feedback form, 2015).

“I have become confident in my expertise, and there has been a change in my leadership capacities as the Head of my Division. I have the responsibility to work with seven male and a female scientist of different expertise and cultural backgrounds. I have learnt to give positive feedback, and patient to give support. I also avoid making instant judgements about colleagues from different cultural backgrounds regarding their working styles. I also promoted an open exchange of ideas and encourage colleagues to make efforts to get things work”(2013 cohort, fellow with a doctoral degree, questionnaire/ feedback form, 2015).

Based on quantitative ratings, only five percent of fellows had “high” levels of the capacity to leverage team talents at the start of the fellowship; this shifted to 91 percent, indicating they had “high” to “very high” levels after the fellowship period. Almost all fellows (98 percent) reported increases in their ability to leverage the talents of other members of their team. The distribution of ratings before and after the fellowship is shown in Figure 7. The data show that fellows’ self-ratings for leveraging team talents improved significantly during the fellowship.

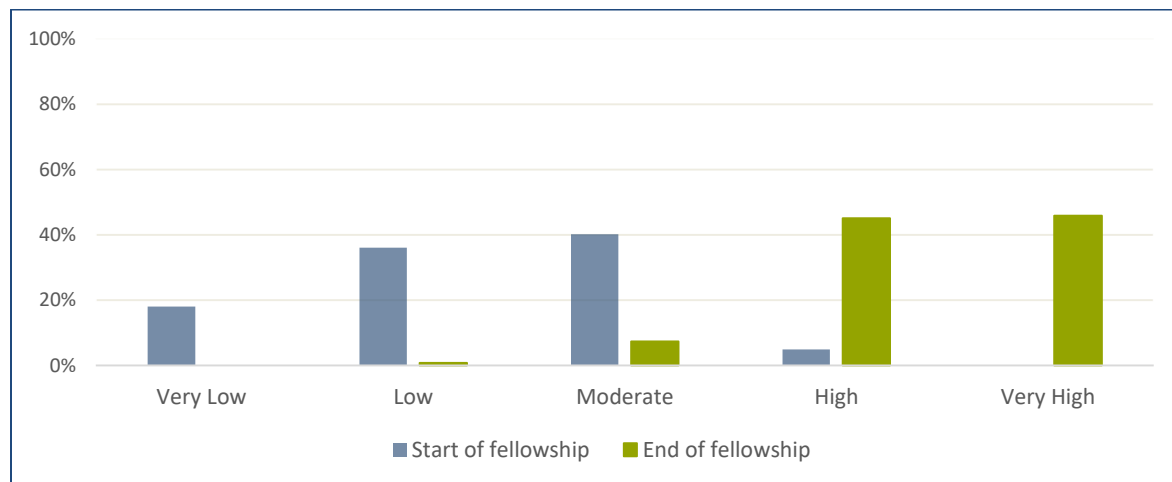


Figure 7: Ratings for ability to leverage team talents before and after the fellowship

In terms of their capacity to leverage team talents, 22 percent of fellows provided stories deemed as credible qualitative evidence of change (illustrated in Figure 2), for example:

“I have become more assertive and more expressive to the people that I work with and lead in the field. For example, before we start working on a particular field project I meet with everyone involved in the activity and make sure that we understand the goals and

the end results that we need to achieve. I have been able to plan and execute field activities timeously due to my effective planning and motivation of the staff.”
(2013 cohort, fellow with a doctoral degree, questionnaire/ feedback form, 2015).

Negotiation skills

Compared to their male colleagues, women are less likely to negotiate on behalf of themselves in the workplace which impacts on both their earning potential and their career advancement (Babcock and Laschever, 2003; Leibbrandt and List, 2015). Effective negotiation skills are thus important for female scientists.

Based on quantitative ratings, only four percent of fellows had “high” levels of capacity to negotiate at the start of the fellowship; this shifted to 91 percent, indicating they had “high” to “very high” levels after the fellowship period. Again, almost all fellows (98 percent) reported an increase in their ability to negotiate during the fellowship period.

The distribution of ratings before and after the fellowship is shown in Figure 8. The data show that fellows’ self-ratings for negotiation skills improved significantly during the fellowship.

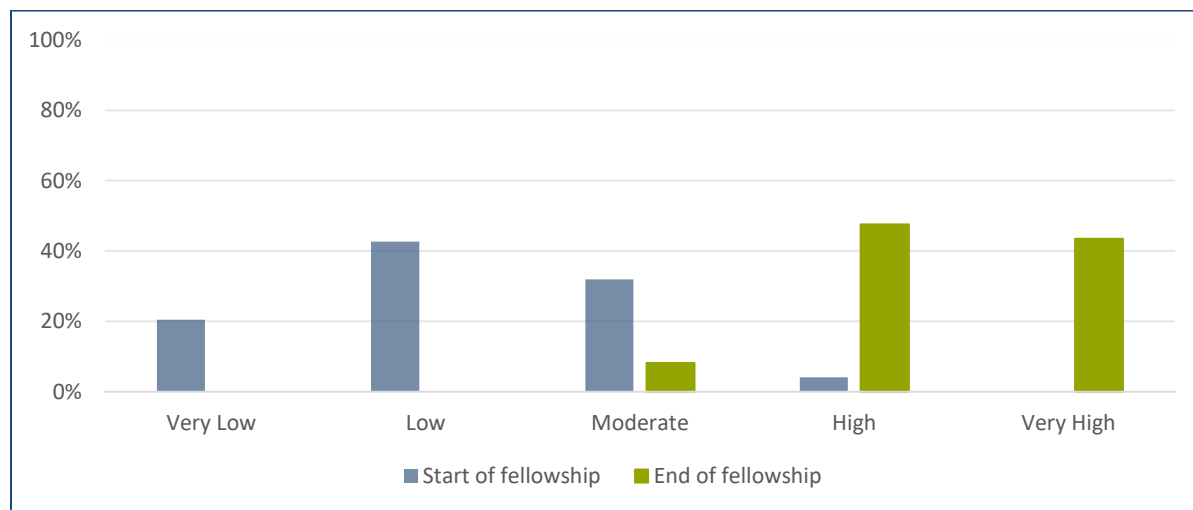


Figure 8: Ratings for negotiation skills before and after the fellowship

In terms of their capacity to negotiate, 10 percent of fellows provided stories deemed as credible qualitative evidence of change (illustrated in Figure 2), for example:

“I would base my example on my role as a project coordinator in which i had to deal with the day to day activities to make sure that the project activities were being achieved. My growth as a leader was visible when I had to handle various field work challenges. In one instance, one of my site coordinator had some conflict of interest with our PI and decided to resign (but without a formal procedure) This was a critical time in the project as we were collecting sensitive data and samples from farmers. The PI could not travel to the field so i was sent to solve the problem to have a win-win situation. I handled the matter in the field and recruited a replacement site coordinator. I was dealing with men

who sometimes looked down upon me but my leadership coat and awareness created during the fellowship programme enabled me to handle my activities more effectively and with professionalism”(2014 cohort, fellow with a doctoral degree, questionnaire/ feedback form, 2015).

“I am leading a project with farmers in my research study where I am training them processing skills and linking them to markets. I negotiated affordable prices between the buying companies and the farmers. (2014 cohort, fellow with a bachelor’s degree, questionnaire/ feedback form, 2015).

Programmatic contribution to changes in leadership capacity

Fellows were asked to reflect on the fellowship’s contribution to the change they experienced in terms of their leadership capacity through a qualitative and quantitative question, as discussed in the methodology section. Figure 9 illustrates triangulated responses on the fellowship’s contribution to the changes in leadership capacity. It is clear that the fellowship played an important role in facilitating change for fellows in terms of presenting themselves professionally, navigating diversities, leveraging team talents, negotiating, networking, and formal mentoring, with triangulated evidence for a *strong verified role* reported by 81 percent of fellows.

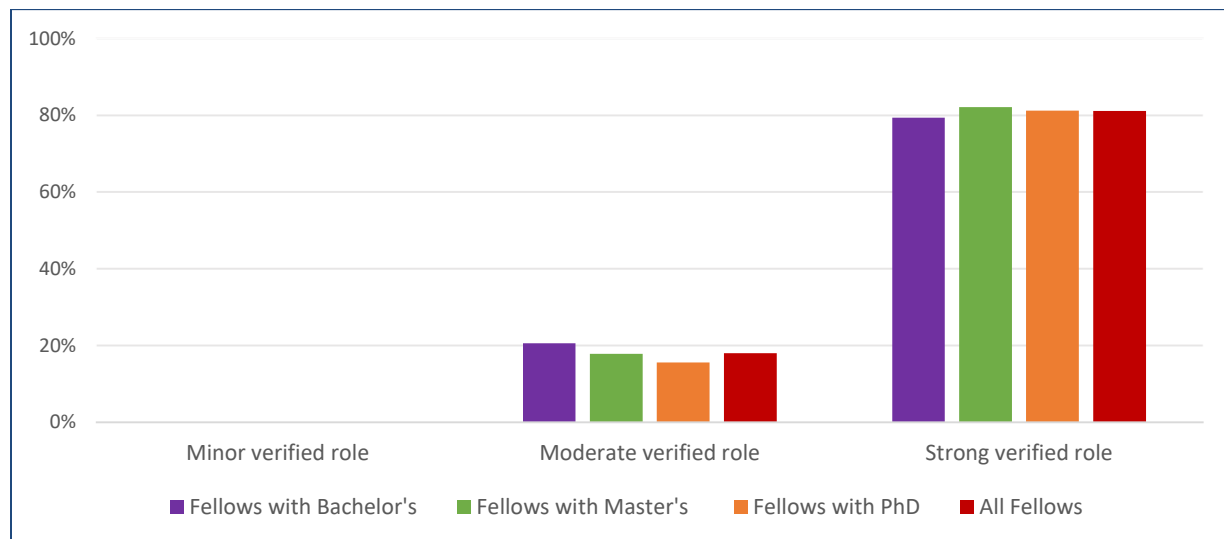


Figure 9: AWARD’s contribution to leadership changes

Conclusion

As noted by the International Food Policy Research Institute (IFPRI, 2014) the diverse points of view of women in agricultural research are needed to encourage innovation, policy change, and sustainable food production for balanced nutrition. However, merely increasing the absolute number of women in agricultural research is not enough. Both career advancement and retention

are crucial for women in agriculture, since strengthening Africa's agricultural research capacity requires participation from women appointed in senior, decision-making roles (Beintema and Di Marcantonio, 2010).

However, leadership development programs typically conducted by African agricultural research institutes miss the critical range of diverse perspectives necessary to develop leadership skills in women scientists (Beintema and Di Marcantonio, 2009). The findings described above show that the leadership component of the program has contributed to overcoming these challenges, promoting growth in key areas of soft skills development for women leaders to overcome the difficult transition from technical experts to leaders, as highlighted by Andres (2011) and Sheridan (1998).

In particular the program has made important contributions to improving the capacity of female scientists to present themselves professionally and confidently, to access and leverage networks and to manage workplace diversity. These findings are particularly important given that lack of confidence in professional environments, and the inability to leverage networks are two of the primary gender specific challenges women face in the workplace (Debre and the Center for Gender in Organizations, 2007; Srivastava, 2015; Sarsons and Xu, 2015).

The program was designed to include a leadership, science skills and mentoring component, in response to the need identified in African agricultural research institutes (Goh *et al.*, 2008). In this context one of the leadership outcomes anticipated was that fellows from the program will acquire mentoring skills, and apply these within their own context. The evidence presented confirms that this is indeed the case, and that leadership development programs for women in African agricultural research can benefit from including mentorship components in their range of offerings.

The positive shifts reported by the fellows, and the strong linkages drawn to the program's contribution to the changes confirm the success of and need for programs of a similar nature to set the foundation for women in agricultural sciences to succeed. Several key lessons can be drawn from the program experience that have application for similar initiatives.

- The importance of developing the confidence, self-efficacy and assertiveness of female scientists should not be underestimated, and should be intentionally nurtured.
- Implementing a range of activities which can contribute synergistically to capacity development enhances the success of capacity development initiatives; in this way, the competence (science skills) and confidence (soft skills) of women can both be developed. This combination enhances the likelihood of women rising in leadership positions.
- Ongoing monitoring and evaluation enables capacity development initiatives to understand their core strengths, and should be built into the design of the program from the outset.

Further research is however required to examine the impacts of the program on the longer-term career progress of fellows, to determine whether they are retained in the system and advance to high level positions of influence. The recent completion of the fellowship for these cohorts (2015 and 2016 respectively) meant that retention and career progress could not yet be measured, but the programs strong alumni network provides a platform for longitudinal tracking of fellows in years to come.

As the global and African development agendas increasingly open up opportunities for women scientists (through mechanisms such as the Sustainable Development Goals and the Science, Technology and Innovation Strategy for Africa), it will be necessary to ensure that the pool of available women is adequately prepared with the full range of skills that they need to take up leadership positions and thrive to their full potential. This will require an increase in the number of programs available to develop the holistic capacities of female scientists, such as the program described; lessons learnt from this initiative can contribute to their successful design.

References

- Andres, J.T.H. (2011) Overcoming gender barriers in science: facts and figures', *Science and Development Network*. Available at: <http://www.scidev.net/global/education/feature/overcoming-gender-barriers-in-science-facts-and-figures-1.html>
- AWARD. (2017) *African Women in Agricultural Research and Development (AWARD)*. Available at: <http://awardfellowships.org>
- Babcock, L., & Laschever, S. (2003) *Women don't ask*. Available at <https://apps.uqo.ca/LoginSigparb/LoginPourRessources.aspx?url=http://www.books24x7.com/marc.asp?bookid=69989>
- Beintema, N.M. and Di Marcantonio, F. (2009) *Women's Participation in Agricultural Research and Higher Education: Key Trends in Sub-Saharan Africa*. Washington DC and Nairobi: IFPRI and CGIAR Gender and Diversity program. Available at: <http://www.asti.cgiar.org/pdf/ASTI-AWARD-brief.pdf>.
- Beintema, N.M. and Stads, G.J. (2006) *Agricultural R&D in Sub-Saharan Africa: An Era of Stagnation. Background Report*. Washington DC: International Food Policy Research Institute. Available at: https://www.asti.cgiar.org/pdf/AfricaRpt_200608.pdf
- Blickenstaff, J.C. (2006) 'Women and science careers: leaky pipeline or gender filter?', *Gender and Education*, 17(4), pp. 369-386. Available at: <http://www.tandfonline.com/doi/full/10.1080/09540250500145072>
- Cronin, C. and Roger, A. (1999) 'Theorizing Progress: Women in Science, Engineering, and Technology in Higher Education', *Journal of Research in Science Teaching*, 36(6), pp. 639-661.
- Debre, G. & The Center for Gender in Organizations. (2007) *Inspiring Transformation...Lessons from the CGIAR Women's Leadership Series*. Consultative Group on Agricultural Research Gender & Diversity Program, Working Paper 47. Available at: [http://library.cgiar.org/bitstream/handle/10947/2752/47 %20Inspiring%20Transformation...%20Lessons%20from%20the%20](http://library.cgiar.org/bitstream/handle/10947/2752/47%20Inspiring%20Transformation...%20Lessons%20from%20the%20)
- CGIAR%20Women's%20Leadership%20Series_genderdiversity_WP.pdf. Dedoose. (2017) *Dedoose. Great Research Made Easy*. Available at: <http://www.dedoose.com/>
- Duran, A. and Lopez, D. (2015) *Impact of Diversity on Organization and Career Development*. C. Hughes (Ed.). Hersey, PA: IGI Global. doi:10.4018/978-1-4666-7324-3

Eagly, A.H. and Carli, L.L. (2007) *Through the Labyrinth: The Truth About How Women Become Leaders*. Boston: Harvard Business School Press.

Elsevier. (2017) *Gender in the Global Research Landscape*. Elsevier. Available at: <https://www.elsevier.com/research-intelligence/resource-library>

FAO. (2017) *The future of food and agriculture – Trends and challenges*. Rome. Available at: <http://www.fao.org/publications/fofa/en/>

Goh, A., Recke, H., Hahn-Rollins, D. and Guyer-Miller, L. (2008) *Successful Women—Successful Science. CGIAR Gender & Diversity Working paper 48*. Rome, Italy: Consultative Group on International Agricultural Research (CGIAR). Available at: <http://portal.oas.org/LinkClick.aspx?fileticket=rJV04liGysw%3D&tabid=1527>

Goleman, D (1998) ‘What Makes a Leader?’, *Harvard Business Review*, 76(6), pp. 93-102.

Hewlett, A., Marshall, M. and Sherbin, L. (2013) ‘How diversity can drive innovation.’ *Harvard Business Review*. Available at: <https://hbr.org/2013/12/how-diversity-can-drive-innovation>

Hill, C., Corbett, C. and Rose, A.S. (2010) *Why So Few? Women in Science, Technology, Engineering and Mathematics*. Washington DC: AAUW. Kotter, J.P. (2001) ‘What Leaders Really Do’, *Harvard Business Review*, 68(3), pp. 103-111.

IFPRI. (2014) *2013 Global Food Policy Report*. Washington DC: International Food Policy Research Institution (IFPRI).

Leibbrandt, A. & List, J. (2015) ‘Do Women Avoid Salary Negotiations? Evidence from a Large-Scale Natural Field Experiment’, *Management Science*, 61(9), pp. 2016-2024.

Lussier, R.N. and Achua, C.F. (2012) *Leadership: Theory, Application & Skill Development*, 5th Edition. South-Western: Cengage Learning.

McCullough, L. (2011) *Women’s leadership in science, technology, engineering and mathematics: barriers to participation*, *Forum on Public Policy: A Journal of the Oxford Round Table*, 2011(2), pp. 1-11. Available at: <http://files.eric.ed.gov/fulltext/EJ944199.pdf>

Ofir, Z., van Wyk, B. & Etta, F. (2008) *Comparative Evaluation of the G&D Rockefeller and Borlaug Women in Science Fellowship Programs*. Consultative Group on Agricultural Research Gender & Diversity Program, Working Paper 49. Available at: http://library.cgiar.org/bitstream/handle/10947/2754/49_Comparative%20Evaluation%20of%20the%20G%26DRockefeller%20and%20Borlaug%20Women%20in%20Science%20Fellowship%20Programs_genderdiversity_WP.pdf?sequence=1

Robles, M.M (2012) ‘Executive Perceptions of the Top 10 Soft Skills Needed in Today’s Workplace’, *Business Communication Quarterly*, 75(4), pp. 453-465.

Sarsons, H. and Xu, G. (2015) *Confidence Men? Gender and Confidence: Evidence among top economists*. Online. http://scholar.harvard.edu/files/sarsons/files/confidence_final.pdf (accessed 8 October 2016).

Sheridan, K. (1998) ‘Some thoughts on future directions of economics’, *Journal of Applied*

Economics and Policy, 17(1), pp. 93-95.

Srivastava, S (2015) 'Women are as successful but are less confident than men.' *The Tech*, 136 (5). Available online at <http://tech.mit.edu/V136/N5/women.html>

Willemsen, T. (2016) *How Mentoring Can Help Women Scientists*. *SciDev.Net Article*. Available from: <http://www.scidev.net/global/capacity-building/opinion/how-mentoring-can-help-women-scientists-1.html>