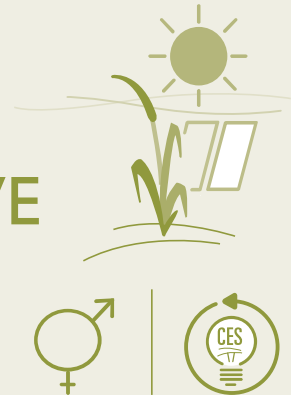




**POWERING  
AGRICULTURE:**

AN ENERGY GRAND CHALLENGE  
FOR DEVELOPMENT

# A POWERING AGRICULTURE GUIDE TO GENDER RESPONSIVE PRODUCT DEVELOPMENT



## WHAT IS THE PURPOSE FOR THIS GUIDE?

Product development is the mechanism by which a company creates a clean energy solution (CES) that is appropriate, affordable, and responsive to the needs of a wide customer base. This guide will help you incorporate gender considerations into the product development process to address the challenges faced by women and men farmers and engineers in developing countries.

The product development process mainly serves to reduce the risk associated with introducing new products into the market. Understanding both the male and female market segments is critical to effective risk mitigation and maximizing the potential for market upscaling. As the product development process progresses, you can maintain the gender responsiveness of your CES through systematic market research, benchtop testing, and customer engagement. At the end of this guide, you will find a checklist to guide you in this process.

## WHY SHOULD YOU CARE ABOUT FEMALE CUSTOMERS?

- It makes **business sense** to invest in developing products and services that are attractive and accessible to a broader market of both female and male users, and to build diverse technical, management, and sales teams. Women may prove to be the primary market for your CES because it will alleviate responsibilities that are primarily undertaken by them. Furthermore, in some cultures women are the ultimate decision makers regarding investment decisions at the household level. Without building gender considerations into the CES early on, you risk missing out on the full potential of this market segment.
- It makes **financial sense** if you plan to raise capital from social impact investors or international development sources. Many investors will not invest unless gender equality is an explicit outcome with meaningful activities designed to achieve it. Virtually all donor-funded credit lines and financing facilities are explicitly committed to gender mainstreaming in their lending and investment decisions.
- It is the right thing to do, especially for mission-driven entrepreneurs and their supporters. In addition to commercial gains, **gender equality matters**. CES, particularly those intended for use by small farmers, can have significant impact on reducing women's labor burden and positively transform the way in which women and men work and live together—both within communities and within companies. It can also be a key contributing factor to food security (Sida 2015).

## HOW CAN GENDER CONSIDERATIONS BE INTEGRATED INTO YOUR CES PRODUCT DEVELOPMENT PROCESS?

*Your CES can be made more gender-responsive through the application of two general strategies:*

- **Identify how your CES provides a solution specific to the challenges faced by both women and men in agriculture**
- **Ensure the product development and manufacturing teams are comprised of both women and men from diverse backgrounds.**

*There are five general stages to the Product Development Process, and each stage has unique gender considerations. We will briefly describe each stage and how these strategies can be applied to each stage.*

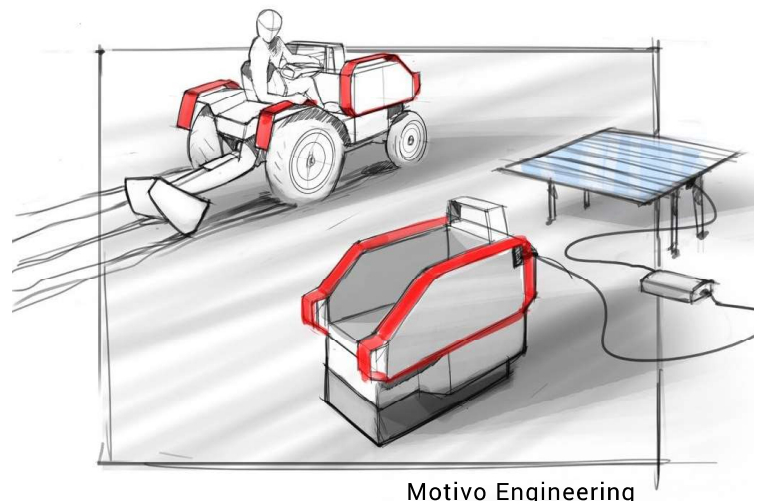
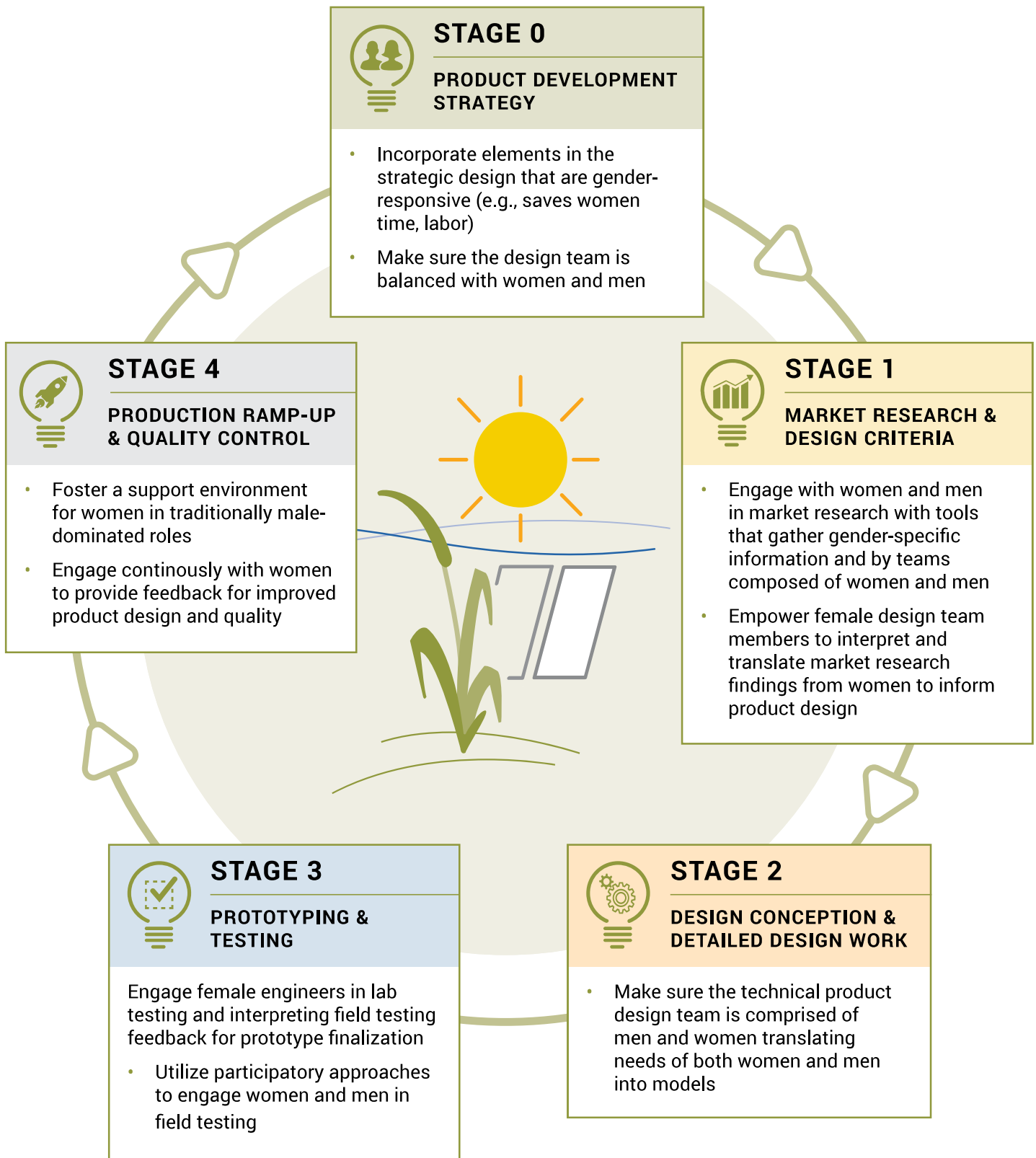


Figure 1: Basic Product Development Process Progression





## STAGE 0: PRODUCT DEVELOPMENT STRATEGY

The Product Development Strategy helps guide you in deciding the order in which product development tasks will be undertaken, their individual work scopes and timelines, and the resources that will be devoted to each effort. The Product Development Strategy is guided by pre-existing knowledge that identifies potential market opportunities. This knowledge may come from your sales, marketing, customer service, and research and development teams, through interactions with their male and female peers and customers.

When your initial problem statement includes challenges faced by women and men, you are more likely to produce a gender-inclusive CES product that is attractive to a wider audience (3D4AgDev Program). However, a significant number of designers miss opportunities to engage women—both within design teams and within communities—in product development (FAO 2015, IFAD, 3D4AgDev Program). As a result, they fail to optimize technology benefits and potential success of the product.

In addition to missed opportunities for maximizing the benefits of CES technologies, designers inadvertently introduce technologies with unintended negative consequences for women. Negative unintended consequences of new technology design can include (FAO 2015, IFAD):

- Inaccessibility of new technologies leading to diminished ownership by women of the means of production
- Changes in land use patterns that make land less accessible to women
- Reduction in women's paid labor due to mechanization (without an alternative income-generating source)

- Shifting of women laborers into less desirable, safe, or profitable work

When your product design team includes women, it will benefit from a wider range of perspectives and problem-solving skills that can lead to more innovation. Female team members have greater access to female beneficiaries, can obtain female input more efficiently during product design, and will develop relationships that support technology adoption (Rojas, et al). Female team members have a greater ability to understand and advocate for the needs of female end-users. To find qualified female staff, you may have to reach out to university math and engineering departments and professional organizations with an open call for candidates.



## STAGE 1: MARKET RESEARCH AND DESIGN CRITERIA

The product development process begins with market research to clearly define customer needs, desires, and willingness to pay. This research is typically done through a combination of in-person interviews and experiments that test how both women and men interact with functional models of the potential product. Gender integration activities during the market research and design stage will ensure that the CES is designed appropriately for potential male and female customers.

*Here are some suggested actions to ensure gender integration in this stage:*

- Try to build trust and social standing with the community that you are engaging. This means long and frequent visits with male and female community members, leaders, and social groups. After collecting the results of your field research, you must interpret the collected information into design criteria. Design criteria identify common male and female customer needs in the market

research, connect those needs to product features, and create form factor and price constraints on the product.

- Make sure to engage women and men in the early stages of market research to generate reliable and rich information that tells a complete story. This will facilitate a design that maximizes technology adoption by female farmers and entrepreneurs. “Gender-neutral technologies” that imply equal access, use, and benefit for men and women do not take into account the fact that women and men demonstrate different preferences in energy solutions. Women prioritize functionality, while men seek solutions that “demonstrate position, power and visibility” (USAID/IUCN 2014). Benefits designed for men do not “trickle-down” to women, and women and men often demonstrate different preferences in energy solutions (USAID/IUCN 2014).
- Keep in mind that men are formally overrepresented in the agricultural industry despite high levels of informal women’s participation. For example, in Southern Asia and sub-Saharan Africa, over 60% of all working women remain in agriculture, often concentrated in time- and labor-intensive activities (ILO 2016), yet globally, women account for only 9% of the construction workforce and make up only 12% of engineers (UNIDO 2014), and only 15% of agricultural extension workers (FAO 2015).
- You can engage women through interviews, focus group discussions, and experiments involving use of the technology with close observation. Particularly in more conservative communities, you need to identify where women congregate as part of your engagement strategy. Pay special attention to barriers that limit women’s ability to participate in product design such as social and cultural norms, lack of access to transportation, and competing household responsibilities. You can overcome

these barriers by involving women’s groups, such as formal cooperatives, religious-based groups, and other informal or support groups. Make sure to empower female colleagues on the market research team to elicit more reliable and meaningful research on women farmer product requirements.

- Pay attention to technology design issues that impact technology adoption by women. Common design errors that inadvertently exclude women from benefiting from CES include: a product that is too heavy or cumbersome, operation that requires movements or positions that are not culturally acceptable for women, and product operation that requires literacy levels that fewer women than men meet (Rojas et al, FAO 2015, IFAD):
- Take women’s lower physical strength into account when designing portable products. For vehicles, you should be sure that units can be adjusted to accommodate women’s smaller stature. The location of communal machinery should be based on in-depth community consultation with both women and men to ensure it is in an area that is convenient, safe, and practical for women to visit.



Photo: Rebound Technologies



## STAGE 2: DESIGN CONCEPTION AND DETAILED DESIGN WORK

With the design criteria in hand, your product development team will create and evaluate several product concepts. It is common to test key assumptions of the concept operation in the lab to ensure that the product is technically feasible. The most promising concept(s) will be developed into a detailed design. A detailed design will outline what the product will look like, how it will be assembled, and all the components within the initial prototype. The output of a detailed design is usually a 3D model, 2D drawings, and a bill of material.

Your development team should be able to incorporate female-specific design criteria identified during market research into the detailed design of your CES. In order to translate design criteria appropriately into technical designs and specifications, make sure that female engineers are part of the team.



## STAGE 3: PROTOTYPING AND TESTING

Once the initial detailed design is completed, it is possible to assemble an alpha prototype that is used to confirm that every component is functioning as expected and that every subassembly is interacting with the rest of the prototype in an expected manner. Field testing can be used to confirm that the market research team correctly identified the design criteria for the product and to confirm that the product functions properly in the field environment. The initial, alpha prototype is frequently not manufactured in the intended manner as the finalized product, in fact it is common to make the alpha prototype out of a mix of off-the-shelf and custom-made components. Field testing may reveal a design flaw or incorrect design criteria, so it is normal for you to reexamine the

detailed design at least once following Prototype Testing. Stage 3 concludes with the testing of the beta prototype, which is produced to test product manufacturability, ergonomics, and last-minute design changes.

*You can ensure that your CES prototypes are appropriate for both women and men users by following the suggestions below:*

- Promote gender equality within your fabrication and prototyping supply chain by putting requirements in place for manufacturers, suppliers, and fabrication companies. Your female employees may be discriminated against in traditionally male-dominated work environments such as parts manufacturers and factories. You can positively influence the way manufacturers and suppliers work by including quotas for female engineers and managers in procurement requirements, as well as requirements proving equitable and safe work environments and policies. However, male domination of manufacturing is a complex dynamic rooted in centuries of cultural norms that will not change overnight; recognize that transforming traditionally male-dominated fields and work places will be a slow and challenging process. It is important to identify male champions within manufacturing companies, suppliers, and communities who will support this transition.
- Engage female engineers in lab testing and during the prototype build to elicit additional female perspective on the CES design, use, and ergonomics. This serves to ensure that the original stories gathered during market research from women and men have been translated appropriately throughout the design process. Following field testing, it will be equally important for male and female design team members to ensure that the male and female user experience influences any changes and finalization of the prototype design.

- Utilize a participatory approach that engages input from women and men when you are conducting field tests. Using women’s groups and leaders as an entry point, you can conduct separate product design input meetings with men and women. Women should be specifically consulted about the best times to hold these meetings, as their time availability may be limited by both household and external work responsibilities (FAO 2015). Conducting separate meetings also ensures that women are able to freely express their opinions and insight without being marginalized by men. It is important that the field testing team is comprised of both men and women to ensure that the team is able to effectively liaise with potential female users. Strategically choosing demonstration plots with a mix of female-only and equitable couples may serve as effective role models that can promote equitable and beneficial use of the CES.



#### STAGE 4: PRODUCTION RAMP-UP

The transition from prototype to finished product that is ready for mass manufacturing requires

changes to the detailed design of the product. This is to accommodate the quality control testing regime, limitations of the proposed manufacturing techniques, and reduction of manufacturing cost and time. Initial production runs should be limited in size to allow for training of the manufacturing and quality control staff and to ensure that the production quality is as expected. You will need to create a quality control system that not only tests raw material and finished projects that go into and come off the assembly line, but also responds to feedback from the marketplace.

Ongoing engagement with professionals, community groups, and individual male and female end-users is critical to a responsible and nimble quality control system. Cultivate an open-door approach that ensures female end-users are also able to express ongoing concerns, suggestions, and comments regarding the quality and utility of the CES. Also, Production Ramp-up heavily involves manufacturing, a traditionally male-dominated industry, so many of the suggestions in Stage 3 that address increasing gender equality within your supply chain are also applicable in Stage 4.



# APPLICABLE GENDER INCLUSION QUESTIONS FOR EACH DESIGN STAGE

0	<b>STAGE 0 PRODUCT DEVELOPMENT STRATEGY</b>	<ul style="list-style-type: none"> <li>• Does the product design strategy address gender-specific challenges important to both women and men (e.g., time savings, labor reduction, ease of use, etc.)?</li> <li>• How balanced is the product design team with both men and women from diverse backgrounds, who are supported and enabled to offer gender-specific ideas and solutions?</li> <li>• To what extent is the input of women farmers/entrepreneurs continuously sought to inform new CES technologies or next versions of the product?</li> </ul>
1	<b>STAGE 1 MARKET RESEARCH &amp; DESIGN CRITERIA</b>	<ul style="list-style-type: none"> <li>• How well does market research uncover challenges faced by potential male and female consumers (considering age, income, position in household, land ownership status, and geographic location)?</li> <li>• How well does market research integrate social and gender analysis to consider the different priorities, roles, and decision-making power of women and men in relationship to how they may purchase or use my technology?</li> <li>• To what extent do gender-specific market research findings inform the design of the product specific to the various demographics of targeted male and female technology users?</li> </ul>
2	<b>STAGE 2 DESIGN CONCEPTION &amp; DETAILED DESIGN WORK</b>	<ul style="list-style-type: none"> <li>• To what extent are product design positions filled by female engineers and scientists?</li> <li>• To what extent do both female and male engineers and scientists demonstrate understanding to translate market research identifying different design needs of women and men into design features?</li> </ul>
3	<b>STAGE 3 PROTOTYPING &amp; TESTING</b>	<ul style="list-style-type: none"> <li>• What types of requirements are in place for manufacturers, suppliers, fabrication companies, and others to ensure gender equality within all operations, empowerment of women in science and engineering fields, and female-friendly work places?</li> <li>• To what extent are female engineers involved in lab testing of the prototype to provide feedback from a female perspective on design, use, and ergonomics?</li> <li>• How well are both male and female agronomists, technicians, etc., trained on how to effectively identify and target male and female clients for prototype testing?</li> <li>• Are demonstration plots strategically chosen to empower females and equitable male/female farm owners to set a positive example for other men and women, e.g., "At least 30% of farmers/entrepreneurs targeted in prototype testing are women, and at least 20% are equitable farm couples?"</li> <li>• To what extent does field testing engage with existing community organizations, including women's organizations and cooperatives, to leverage knowledge and test the product?</li> <li>• To what extent do findings from prototype testing incorporate women's feedback, opinions, and experience to redesign the product and ensure it meets needs of women and addresses strategic gender equality goals of the CES, e.g., time savings, labor reduction, etc.?</li> </ul>
4	<b>STAGE 4 PRODUCTION RAMP-UP &amp; QUALITY CONTROL</b>	<ul style="list-style-type: none"> <li>• To what extent do contractual obligations with manufacturers and suppliers include gender-specific quotas and requirements (e.g., "30% of engineering, technical, or management positions filled by women"; "management and male managers demonstrate support for female managers and engineers.")</li> <li>• How well are local male leaders, male businessmen, and others within the company, suppliers and manufacturers, and the community engaged to advocate for women as engineers, technicians, and entrepreneurs in the uptake of technology to foster a supportive environment for women?</li> <li>• To what extent are professional growth and mentorship opportunities provided equitably to both male and female engineers within the company, suppliers, and entrepreneurs and clients?</li> <li>• To what extent does the quality control process engage with professional and community women's groups to identify potential product beneficiaries in the target population?</li> </ul>



## SOURCES AND ADDITIONAL RESOURCES:

The W+ Standard [www.wplus.org](http://www.wplus.org)

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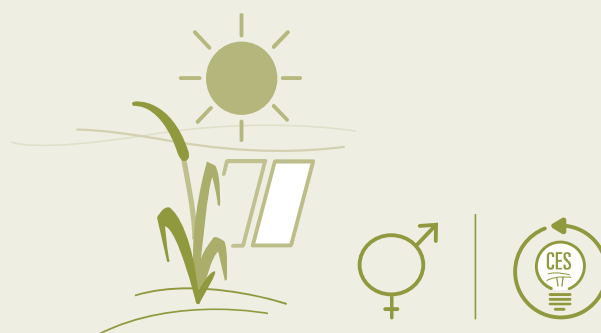
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Further information about Powering Agriculture can be found at [PoweringAg.org](http://PoweringAg.org)

