ANALYSIS OF WOMEN'S ADOPTION AND UTILIZATION OF SELECTED NCAM AGRO-PROCESSING EQUIPMENT

https://doi.org/10.63749/agrimech.5.1.1008x

Ameh, S. D., Adi, K. F, Ibrahim, S. Y., Suleiman, N. O., Onah, R. O. and I. C. Ozumba
Agro Industrial Development and Extension Department,
National Centre for Agricultural Mechanization (NCAM), Ilorin, Kwara State

ABSTRACT

The study examined the level of awareness, perception and utilization of NCAM agro-processing equipment by women agro-processors. A cross-section of 76 women agro-processors drown from across the six geo-political zones of the country was used for the study. A well-structured questionnaire was used to collect data for the study and analysed using both descriptive and inferential statistics respectively. Result from the analysis indicated that there was generally a very low awareness and level of exposure to agro-processing equipment among the respondents with only 20% exposure rate and just 18% awareness of NCAM technologies among the women agro-processors. The result of the correlation analysis showed that, there exist a significant and positive relationship between the practice of mechanized agriculture, previous operational knowledge of mechanized processing machines and interaction with NCAM Equipment, highlighting the significant effect of exposure and hands-on practical experience in promoting the adoption of machines. There was a very high level of participant's engagement with cassava and oil palm processing equipment, the most engaged includes cassava peelers, mechanical graters, and garri fryers being the most used and rated the easiest to operate among all the machines. In contrast, there was a lower level of use with the melon and oil palm processing equipment demonstrating the need for strategic awareness campaigns among women agro-processors. Further-more, the study underscore the significance of gender-responsive technology designs and the need for continuous capacity building in the promotion of agro-processing equipment, in order to drive high rate of adoption among the agro-processors thereby, enhancing productivity and, decreasing drudgery as well as increasing rural lively-hood support.

Keywords: Agro-processing, adoption, mechanization, women, utilization, equipment

1. INTRODUCTION

Globally, agri-food system are a major employer of women, the sector employs about 36% of working women and 38% of working men in the agri-food systems as of 2019. In southern Asia, 71% of women in the labour force work in the agri-food system versus 47% of men. In sub-Saharan Africa, 66% of women's employment is in agri-food systems, compared with 60% of men's employment (FAO, 2023). The roles of women in off-farm work in agri-food systems are more likely to be in less-profitable value chains due to restrictive traditional, social norms or poor access to assets and resources (FAO, 2023). Agro-processing allows for the transformation of raw agricultural products into higher-value products. Women involved in this sector contribute to adding value to the agricultural output, making it more marketable, profitable and contributing to the overall sustainability of agricultural systems (Bungile, 2023).

Women farmers often bear the dual burdens of household responsibilities and farm work, which limits their time and productivity. Additionally, social norms restrict their access to and control over resources, constraining their capacity to fully contribute to and benefit from agricultural advancements and agricultural technologies (Piramal, 2024).

The National Centre for Agricultural Mechanization (NCAM), is Nigeria's leading institution saddled with the responsibility of promoting agricultural mechanization through the design, development and fabrication of affordable, locally appropriate machinery for farmers. It is also responsible for testing, certifying and licensing agricultural equipment like tractors, ensuring quality and safety standards. It promotes capacity building and technology transfer to enhance productivity, food security and promote sustainable farming across the country.

Sustainable agricultural mechanization covers all levels of farming and processing technologies, from simple and basic hand tools to more sophisticated and motorized equipment. "Too often, women lack access to the equipment that they need for farming and food processing, leading to low land and labour productivity, greater work burden and less time for economic opportunities. Consequently, women also need better access to financial resources, information, training and guidance on ways to use sustainable mechanization to improve their livelihoods (FAO, 2024).

Agricultural technologies can potentially transform agricultural systems by creating farm-level and macro gains. However, most agricultural technological solutions do not consider the unique needs and challenges women face. This systematically excludes women farmers as key consumer while also limiting their contribution at the farm level. On the contrary, when technology service providers are gender inclusive, accounting for women's unique needs and challenges, the resulting solutions can unlock significant benefits across agricultural value chains (Piramal, 2024).

Highlighting the significance of training to agro-processors, Sasakawa Africa Association (2018) highlighted that, Women rice processors, over a two-year period, saw an increase in their income, from $939.3 in the dry season and $1089.3 in the rainy season to about $2346.4 and $1996.4 respectively. From their Survey, 49% of trained cooperative members acquired new and relevant skills in agro-processing and value addition while 51% learnt new skills regarding business competence, 51% reported better family nutrition, better social life 49% and an increased job opportunity by 40.5% of the respondents. They asserted that training women on agro-processing is a better way of changing the narrative about gender in the society (Sasakawa Africa Association, 2018).

Mabe (2022) noted that, agro-processing is one of the agricultural value chain activities that can contribute significantly to industrial development and reduce large importation of agro-products with the attendant consequences of high inflation. He asserted that whilst factory agro-processing is still at the infant stage, domestic agro-processing which is dominated by women tends to empower them.

The design of agricultural tools often does not cater to women's specific anatomical and physiological needs, which can hinder their effective use of such equipment, (Yoder *et al.,* 2010). Tailored designs could enhance safety and usability by female farmers. While the adoption of agro-processing technologies by women shows promising trends, challenges remain, particularly in ensuring that technologies are designed with women's needs in mind and addressing the labour implications of such technology. This dual focus is essential for fostering equitable agricultural development (Yoder *et al.,* 2010).

Against this backdrop, this research hopes to analyse women's adoption, utilization and perception of selected NCAM agro-processing equipment. Highlighting, the level of awareness of women on agro-processing equipment, experience with a range of various agro-processing

equipment, evaluates women's perception of the relevance and use of selected agro- processing equipment fabricated by NCAM.

2. METHODOLOGY

The study comprises of women agro-processors drawn from across the six geopolitical zones of the country. A well-structured questionnaire was used to collect data from 76 women agro-processors. Descriptive and inferential statistics such as bar charts, frequency and percentage distribution and correlation analysis was used to analyse the data.

3. RESULTS AND DISCUSSION

3.1 Women Awareness Level of Agro-Processing Equipment

There is a very low level of women awareness and exposure to NCAM agricultural processing equipment, as evidently shown in Figure 1 by just 20% of the agro-processing women as opposed to the very larger percentage of 56% who stated they had no exposure to agro-processing equipment. This indicates a very low level of adoption of agro-processing equipment among the women possibly, due to limited information emanating from inadequate sensitization and financial constraints. This is in conformity with the findings of Chakraborty *et al.* (2022) who opined that a significant majority of the women had a low awareness level regarding agricultural technologies, reporting potential health hazard like tingling and numbness in the hands as a result of manual operation like harvesting, winnowing and other agricultural activities.

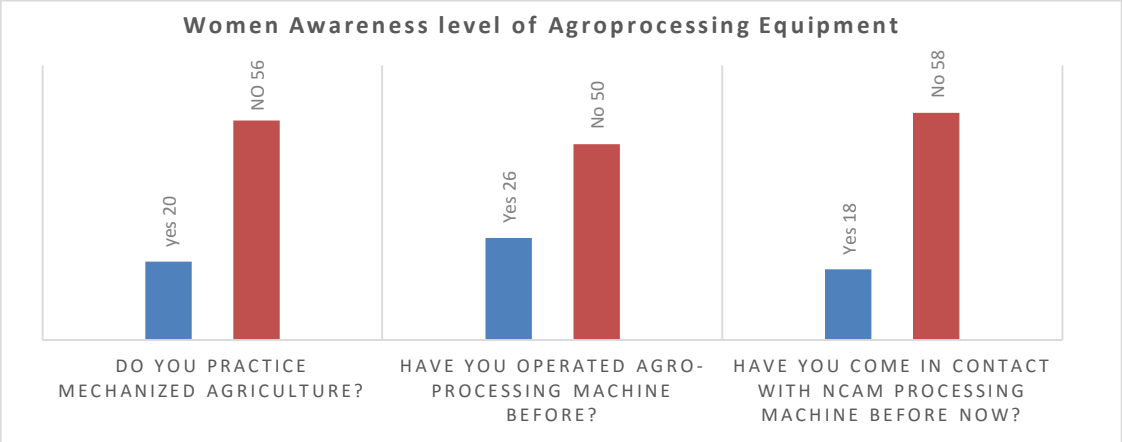

Figure 1. Women awareness level of agro-processing equipment

However, only a minute proportion of 26% of the respondents have had the opportunity of operating agro-processing machines and about half (50%) asserted to have never operated an agro-processing machine. This figure possess a considerable gap in the level of exposure of women agro-processors and worst still to the mechanization services provided by the National Centre for Agricultural Mechanization (NCAM), where only a minute proportion of just 18% had knowledge of NCAM services, while a massive 58% had no prior knowledge. This figure calls for massive awareness and sensitization on agro-processing mechanization so as to improve and better enhance women's familiarity and access to processing technologies, which will lead to a significant enhancement in productivity, reduction of drudgery as well as the empowerment of women across all the value chains of agricultural enterprises. Lakshmi *et al.* (2020) opined that training and capacity building of farmers has the potential of increasing the knowledge and awareness level of farmers to as high as 100% which is determinant to adoption rate of technologies.

3.2 Correlation Analysis showing the level of Awareness of Women on Agro- Processing Equipment

The Pearson result in Table 1 show-cases the correlation relationship between three important variables namely: women practice of agricultural mechanization, prior-operational knowledge of agro-processing machine and contact with NCAM fabricated processing equipment. The results shows that there exist a statistically significant and positive correlation between the practice of mechanised agriculture and having to have operated an agro- processing machine in the past at ($r = .703$, $p < .01$). This indicate that, women who practiced mechanized agriculture at any form are highly likely to have hands on experience with agro-processing equipment, therefore, establishing a close linkage between mechanization experience and likely hood of adoption. Consequently, at ($r = .229$, $p < .05$), there exist a significant but weaker positive correlation between practicing mechanization and contact with NCAM processing machines, though weak relationship, it still establishes that the practices of mechanization has the tendency of exposing one to NCAM'S technologies possibly through training sessions, seminars, work-shops, cooperative societies engagements and field demonstration activities. Additionally, at ($r = .251$, $p < .05$), there exist a positive and statistically significant relationship correlation between having operated an agro-processing machine and having contact with NCAM machines. This therefore reinforces the idea that women, who had experience with processing machines, are more likely to have been introduced to or trained with NCAM-fabricated machines

Table 1. Correlation Analysis showing the level of Awareness of Women on NCAM Agro Processing Equipment

Variables	1. Do you practice mechanized agriculture?	2. Have you operated an agro-processing machine before?	3. Have you come in contact with NCAM processing machine before?
1. Do you practice mechanized agriculture?	1	.703** (p = .000)	.229* (p = .046)
2. Have you operated an agro-processing machine before?	.703** (p = .000)	1	.251* (p = .029)
3. Have you come in contact with NCAM processing machine before?	.229* (p = .046)	.251* (p = .029)	1

The correlation matrix shows that all the three variables are positively significantly associated with one another, highlighting the importance of increased exposure to mechanised agricultural practise and agro-processing operations as a strategy to creating women's awareness and subsequent adoption of NCAM technologies. This has become necessary owing to the benefits attached to technological adaptation. Adeniyi (2022) indicated that, the use of improved technology lead to an enhanced women's contribution to family welfare and improved their livelihood.

3.3 Frequency and Percentage Distribution of Respondents on various NCAM Processing Machines

Table 2 itemise the machine type operated by the participating women agro-processors, showing a significant level of engagement with a vast-array of agro-processing equipment, especially those on cassava and oil palm processing. From the result of the analysis, a proportionate amount of the participating women, indicated hand-on experience with cassava related processing machines. The Cassava peeling tool recorded the highest level of operating rate at 97.4% as stated by the respondents showing that a very large.

Proportion, (74 out of 76) of the studied women agro-processors used the tools during the training. In the same vein, Mechanical Cassava Grater and Mechanical Cassava Mash Sifter

were each operated by 94.7% of the respondents show-casing the significance of these machines to their enterprises. Other highly relevant machines include: Garri Fryer (92.1%), Mechanical Cassava Peeling Machine (92.1%), and the Cassava Mash Dewatering Press (89.5%). This percentage high interest in testing this equipment sheds more light on relevance placed on cassava processing.

Table 2. Frequency and Percentage Distribution of Respondents on various NCAM Processing Machines

Processing Machine	Yes		No	
	Freq. (No)	Percent (%)	Freq. (No)	Percent (%)
Cassava Peeling Tools	74	97.4	0	0.0
Mechanical Cassava Peeling Machine	70	92.1	2	2.8
Mechanical Cassava Washer	58	76.3	4	5.3
Mechanical Cassava Grater	72	94.7	2	2.6
Cassava Mash Dewatering Press	68	89.5	2	2.6
Mechanical Cassava Mash Sifter	72	94.7	0	0.0
Mechanical Garri Fryer	70	92.1	2	2.6
Palm Bunch Stripper	62	81.6	6	7.8
Oil Palm Boiler	60	78.9	2	2.6
Palm Oil Press	66	86.6	0	0.0
Fibre Separator	64	84.2	2	2.6
Steam Generator	62	81.6	2	2.6
Melon Sheller	68	89.5	0	0.0
Shelled Melon Separator	64	84.2	2	2.6
Vertical Fish Smoking Kiln	70	92.1	0	0.0

The result of the analysis shows a very high engagement level with the oil-palm processing equipment, citing about 86.6% of participants engagement with Oil-Palm-Press Machine, 81% engagement with Palm Oil Bunch Stripper, 81.6% engagement with Steam Generator and 78.9%% respectively with Oil-Palm Boiler engagement. This very high level of engagement with Palm Oil Processing Equipment significantly showed the relevance of these machines to the women studied. 89.5% of the despondence engagement with Mellon Sheller was recorded and 84.2% engagement with Shelled Melon Separator. Consequently, the Vertical Fish Smoking Kiln was operated by a very large proportion (92.1%) of the participants, underscoring the relevance and the complementary livelihood potential of fish preservation to women.

Overall, the training organised by NCAM effectively exposed the participating women agro-processors to a wide range of agro-processing technologies, particularly on Cassava and Oil-Palm Processing. This hand-on training strategic style adopted by the centre not only reinforced knowledge acquisition but also boosted their confidence level in operating such machineries and equipment in the nearest future, serving as an essential step towards the promotion and adoption of NCAM- fabricated processing equipment in real-life agricultural settings.

3.4 Evaluation of Women's perception on the relevance and Use of Selected Agro-processing Equipment Fabricated by NCAM

Figure 2 illustrates, the relevance, perception and adoption of various NCAM fabricated machine by women agro-processors within their respective communities. The analysis indicated a very strong interest and usage of Cassava based technologies, highlighting that cassava remains a major crop processed by women in their various localities. Specifically, 46%

of the women affirmed the relevance of Cassava Mash Dewatering Machine and the Mechanical Cassava Mash Grater; this was followed closely by Cassava Peeling Tool and the Mechanical Gari Fryer both of which had a 40 participant response level, underscoring their importance and popularity in the cassava value chain enterprise.

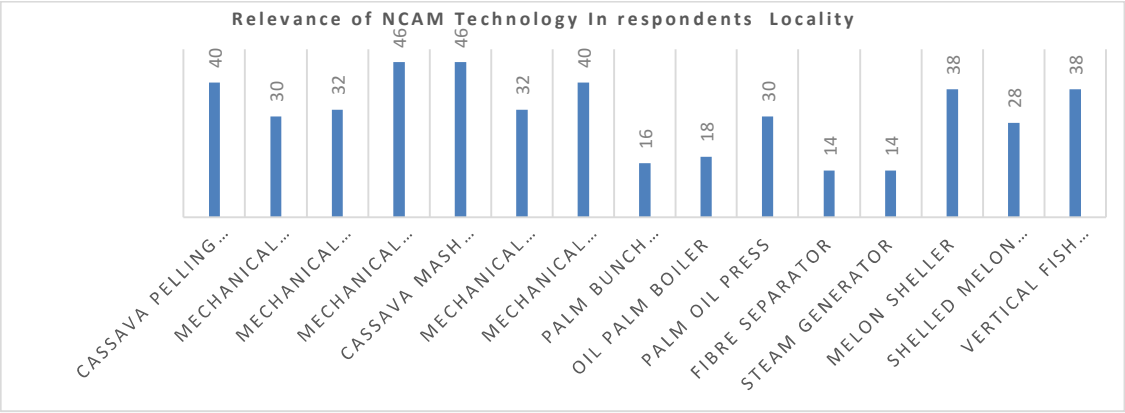

Figure 2. Relevance of NCAM Technology in Respondents Locality

This suggests the notion that Cassava Processing equipment is very important to women's agro-processing. 32 and 30 of the participant mentioned that, the Mechanical Cassava Washer and Mechanical Cassava Peeling Machine are of significant importance to them in their processing value chain. This perfectly aligns with the findings of Egbeocha, Asoegwu and Okereke (2016), who asserted that Mechanization of peeling process has the potential of encouraging growth in cultivation, cassava tuber utilization and improving the product quality. Processing efficiency, minimum loss of tubers and increased processing rate will be affected by improved cassava peeling process. There was a limited engagement with the oil palm based processing machine due to factors such as crop prevalence, accessibility and familiarity, this is shown by the very low response rate from only 18, 16 and 30 of the respondents with regards to the adoption of Palm Oil Boiler, Palm Striper and the Palm Oil Press.

Machines such as the Melon Sheller and the Vertical smoking Fish Kiln only saw a fair level of adoption with just 38 responses each from the trainees. Other less widely used or less understood equipment by the trainees includes Steam generator and Fibre Separators which is alluded to have been adopted by just 14 and 30 participant respectively. The over-all findings indicate that the cassava processing equipment were the most adopted among Women Agro-Processors, affirming that NCAM's intervention in this area are well aligned with the people's felt need which is a core principles of agricultural extension. These facts call for increased sensitization training to encourage the broader adoption of other beneficiary technologies such as the Palm-Oil, Melon and Fish Processing equipment.

3.5 Respondents' Analysis of the Simplicity of Operating Processing Machines

Table 3 highlights respondents' responses on the ease of operating array of machines. Most of the machines were alluded to be user-friendly by a considerable number of the processors, scoring a 4.0 on a 5.0 Likert-scale. With a mean score of 4.66, the Cassava Peelling machine was adjudge to be the most easiest to operate as indicated by 81.6% of the women describing it as "Very Easy", in the same vein, the Vertical Fish Smoking Kiln and the Melon Sheller recorded a high mean scores of 4.57 and 4.53 respectively indicating a significant operational simplicity among users. Ease and user friendly machines including the, Mechanical Cassava Greater (mean = 4.21), Mechanical Cassava Mash Sifter (mean = 4.29), and the Fibre Separator

(mean = 4.18). This tool has been rated high by the respondents with very few noting difficulty in their operations. Though positively rated, some machines are moderately perceived as easy to operate. These include Palm Oil Press, Mechanical Cassava Washer, and Shelled Melon Separator which had mean scores slightly below 4.0, the Palm Bunch Stripper with the lowest mean rating at 3.61% indicating that the respondents found it more demanding compared to others.

Table 3. Respondents' Analysis of the Simplicity of Operating Processing Machines

Category	Processing Machine	Mean Score	Remark
Very Easy to Operate Mean score ≥ 4.20	Cassava Peeling Tools	4.66	Very Easy
	Vertical Fish Smoking Kiln	4.57	Very Easy
	Melon Sheller	4.53	Very Easy
	Mechanical Cassava Mash Sifter	4.29	Very Easy
	Mechanical Cassava Grater	4.21	Very Easy
Easy to Operate 3.60 – 4.19	Fibre Separator	4.18	Easy
	Mechanical Garri Fryer	4.16	Easy
	Steam Generator	4.13	Easy
]	Mechanical Cassava Peeling Machine	4.00	Easy
	Oil Palm Boiler	4.00	Easy
	Cassava Mash Dewatering Press	3.95	Easy
	Palm Oil Press	3.79	Easy
	Shelled Melon Separator	3.74	Easy
	Mechanical Cassava Washer	3.74	Easy
	Palm Bunch Stripper	3.61	Easy

Fundamentally, none of the machines was rated having operational difficulty, thus indicating an over-all user friendliness and satisfaction level, it therefore concludes that most of the women found the machines very easy to use and user friendly in nature which is a critical factor required to driving adoption and consistent use of innovation in a real life situation. This assertion aligns with the work of (Baudron *et al.,* 2015; Ngoma *et al.,* 2023), who posited that "The physical design of technologies, including their size and structure should be considered when designing machines so as to meet the needs of women". A typical example they asserted further is the design of gender-sensitive technology models like smaller horsepower and two-wheel tractors which can be easily operated by women.

3.6 Respondents' Perception of NCAM Technologies

Table 4 highlights the perception and attitude of women towards the use of agro-processing equipment produced by the National Centre for Agricultural Mechanization NCAM. A very significant proportion of the participants (100%), indicated interest in adopting the technologies developed by the centre. This highlights a strong tendency and openness to adopting innovation, suggesting the perceived relevance of that this technologies to their agro-processing enterprises. About 26.32% of the respondents posited a gender unfriendly state of NCAM technologies, this assertion is in line with the findings of Polar *et al,* (2017), positing that, technology itself is not neutral and entails gender biases that can occur when the conditions of the target group (men, women, youth, or other disadvantaged groups) are not considered at different stages. However a large proportion (73.68%) opined that the technological development was very gender friendly and usable. There is therefore the need how-ever to improve on the equipment design that fully captures the physical attributes of women and their role in agro-processing.

Table 4. Respondents' Perception of NCAM Technologies

Statement	Response Option	Frequency (No.)	Percentage (%)
Will you like to use NCAM Technologies?	Yes	76	100.00
	No	0	0.00
Are NCAM machines genders friendly?	Yes	56	73.68
	No	20	26.32

3.7 Women Agro-processors Perceived Reliability of NCAM Technologies

From the result of the analysis in Table 5, 84.21% of the women rated the technology as being "Reliable, 18.42% appraised them to be "Very reliable", notably, none of the respondents had a negative report on the technology "not being reliable" This positive perception by the respondent clearly indicates a strong user confidence on the durability, functionality and consistent performance of the processing technologies, which is key to long term technology adoption and trust building, necessary for recommendation to other users. The analysis collectively connotes the favourable and exceptional ratings of NCAM processing technologies, thereby showing the potential for a sustained usage of technologies developed for women agro-processors given continuous improvement on the user friendliness and efficiency of these technologies.

Table 5. Women Agro-processors Perceived Reliability of NCAM Technologies

Reliability Level	Frequency (No.)	Percentage (%)
Very Reliable	14	18.42
Reliable	62	81.58
Not Reliable	0	0.00

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

There is generally low awareness level of agro-processing equipment as only a minute proportion, (20%) of the women had prior exposure and a mere (26%) with operational knowledge. This can be attributed to low sensitization, limited training and financial constraints. Further-more, the study established only a minute proportion (18%) awareness level of NCAM and its technologies necessitating the need for a continues awareness and sensitization in order to fill this critical gap in outreach and information dissemination by the institution.

The study established that there is a significant correlation between the practice of mechanized processing, past operational experience of agro-processing equipment and the likely hood exposure to NCAM technologies. This assertion therefore indicates that increased involvement of women in mechanized agriculture has the tendency to directly enhance women awareness and the potential adoption of agro-processing equipment.

The training initiative by NCAM significantly boost participant practical knowledge and hand-on interactive experience with various processing equipment, especially the cassava based equipment such as the cassava peeler, grater, mash shifters and garri fryers which were

reportedly most easiest to operate and user friendliness. With increased awareness, the melon Sheller and the oil palm processing equipment has a better likely hood of being adopted, owing to its reported operational simplicity. The findings demonstrate that NCAM technologies are well-aligned with the practical needs of women agro-processors, particularly in cassava processing.

4.2 Recommendations

Generally, the findings supposed that the technologies meet the needs of the women agro-processors especially, with regards to cassava processing. However, there is the need for increased sensitization with regards to other broader value chains equipment such as the oil palm, melon Sheller. Majority of the respondents indicate strong willingness to adopt NCAM technologies, suggesting a positive outlook for improved productivity, reduced drudgery and enhanced standard of living. Therefore, in-order to take full advantages of the potential of mechanization for women agro-processors, emphasis should also be given to gender sensitive designs, improved sensitization and massive support for hand-on training interventions.

ACKNOWLEDGEMENT

Appreciation goes to Mrs. E. I. Eze and Mr. F. O. Anyeji for their vital contributions to the success of this research work.

REFERENCES

Adeniyi, V. A., Akangbe, J. A., Kolawole, A. E., Ayeni, M. D., and Olorunfemi, D. O. (2023). Women cassava processors' livelihood; implications for improved processing technology usage in Nigeria. *Cogent Social Sciences*, *9*(1), 2191898.

Bungile, K.(2023). Empowering Women in Agro processing: A Story of Resilience and Innovation. Centre for Coordination of Agricultural Research and Development for Southern Africa. https://www.ccardesa.org/empowering-women-agro-processing-story-resilience-and-innovation

Baudron, F., Sims, B., Justice, S., Kahan, D. G., Rose, R., Mkomwa, S., and Gérard, B. (2015). Re-examining appropriate mechanization in Eastern and Southern Africa: two-wheel tractors, conservation agriculture, and private sector involvement. *Food Security*, *7*, 889-904.

Chakraborty, S., Singh, K., Singh, L., and Kumravat, B. (2022). Status and awareness of farm women about drudgery reducing technologies in Rajgarh district, Madhya Pradesh. *International Journal of Farm Sciences*, *12*(1), 130–135. https://doi.org/10.5958/2250-0499.2022.00030.1

Egbeocha, C. C., Asoegwu, S. N., and Okereke, N. A. (2016). A review on performance of cassava peeling machines in Nigeria. *Futo Journal Series (FUTOJNLS)*, *2*(1), 140-168.

FAO (2023). The status of women in food production. https://openknowledge.fao.org/server/api/core/bitstreams/e34863d6-a08a-465e-8d65-2b38f611946d/content/status-women-agrifood-systems-2023/chapter1.html.

FAO (2024) Empowering female farmers in crop production systems. https://www.fao.org/plant-production-protection/news-and-events/news/news-detail/empowering-female-farmers-in-crop-production-systems/en#:~:text=In%20crop%20production%20systems%2C%20mechanization,mechanization%20to%20improve%20their%20livelihoods

Lakshmi, V. V., and Deepika, J. (2020). Awareness on Drudgery Reducing Farm Technologies for Gender Equity. 9–19. https://doi.org/10.9734/AJRAF/2020/V6I430110.

Mabe, F. N. (2022). Small scale domestic agro-processing: implications for women empowerment in OTI region of Ghana. *Journal of Women Empowerment and Studies*

DOI:10.55529/jwes.21.30.44.

Ngoma, H., Marenya, P., Tufa, A., Alene, A., Chipindu, L., Matin, M. A., and Chikoye, D. (2023). Smallholder farmers' willingness to pay for two‐wheel tractor‐based mechanisation services in Zambia and Zimbabwe. *Journal of International Development*, *35*(7), 2107-2128.

Piramal, I. A. (2024). Agritech for Women Farmers: A Business Case for Inclusive Growth. World Economic Forum. file:///C:/Users/user/Downloads/WEF_Agritech_for_Women_Farmers_2024.pdf.

Polar, V., Babini, C., Flores, P., Velasco, C., and Fonseca, C. (2017). Technology is not gender neutral: factors that influence the potential adoption of agricultural technology by men and women. CGIAR Research Program on Roots, Tubers and Bananas. La Paz (Bolivia). International Potato Center. 41 p.

Sasakawa Africa Association. (2018). Women's Agro-Processing Enterprises: A source of income for rural women in Nigeria. https://www.saa-safe.org/news/news.php?nt=2&vid=148&lng=usa#:~:text=Over%20a%20two%2Dyear%20period,of%20women%20and%20their%20families.

Yoder, A. M., Adams, A. M., Brensinger, E. A., Hwang, J., and Freivalds, A. (2010). Designing tools and agricultural equipment for women. In *2010 Pittsburgh, Pennsylvania, June 20-June 23, 2010* (p. 1). American Society of Agricultural and Biological Engineers.