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Inclusive rural transformation in Africa: Agriculture mechanization, digitalization, women and youth

Executive Summary

Technologies can potentially transform the future of African agricultural production, making it more attractive, productive, profitable, less burdensome and more closely tied to markets and consumers. Digital technologies are transforming mechanization services and business models, and rejuvenating their activities, as recognized by the Global Conference on Sustainable Agricultural Mechanization, organized by FAO. However, the full potential of sustainable mechanization and digitalization in the agriculture sector will only be realized if inequalities affecting women and youth are fully addressed, to catalyse agricultural transformation.

Capturing the potential benefits of automation and digital revolution and reducing the digital divide for youth and women require tailored solutions and new investment in infrastructure, skills development, energy access and connectivity.

Members, in collaboration with relevant stakeholders and partners, need to enhance women and young people's access to sustainable agricultural mechanization and digital technologies through an enabling environment, pro-poor, gender- and youth--responsive policy measures and targeted programmes.

The objective of this Ministerial session is to promote a shared recognition and commitment among Members to inclusion as core policy objective and concerted actions in national agricultural mechanization and digitalization efforts, so that smallholders, women and youth are provided the necessary support to enable them to equitably benefit from these opportunities.

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I. Background

1.1. Rationale for inclusive mechanization and digitalization

1. Sustainable agricultural mechanization in Africa is seen as an indispensable pillar for boosting agricultural productivity to achieve food security, modernize farming and attain the commitment to end hunger, as stated in the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods and Sustainable Development Goal 2 of the 2030 Agenda for Sustainable Development. Mechanization equipment and services are empowered by digital innovations. "*Global Conference on Sustainable Agricultural Mechanization (GAMC) Introduction Call to Action*",(FAO, 2023)[1]. As articulated by the African Union in its *Digital Transformation Strategy for Africa (2020-2030)*, digital technologies provide important opportunities to modernize the agriculture sector, stimulate job creation and economic growth, and help achieve *Agenda 2063: The Africa We Want*.

2. Effective mechanization and digitalization in the agriculture sector need to address inequalities affecting women and youth to bring about agricultural transformation. Rural transformation in the agriculture sector in Africa cannot be realized leaving women behind, as they play a crucial role in the sector. Women comprise 45 percent of farmers in Africa and 54 percent of those employed in off-farm agrifood systems. "The s*tatus of women in agrifood systems*" (FAO, 2023)[2]. However, their access to and use of mechanization and digital technologies in agriculture is limited due to structural inequalities.

3. The growing youth population and the need to generate more productive and decent employment opportunities are key policy challenges for many African countries today. Growing agriculture mechanization and digitalization can open new employment opportunities for young men and women, through decent youth employment in agrifood systems. Mechanization also significantly reduces the use of children's labour in agriculture, increasing the likelihood of children attending school. "Will promotion of agricultural mechanization help prevent child labour? Policy brief" (FAO, 2021)[3].

1.2. Progress made on mechanization, digitalization and potential benefits for women and youth

1.2.1. Progress on mechanization

"Mechanization can be a powerful force for change, but only if it is environmentally sustainable and leaves no one behind, especially women, and smallholder farmers" (FAO -Director General, 2023)[4].

4. This statement echoes Element 7 of the Framework for Sustainable Agricultural Mechanization in Africa (F-SAMA), developed jointly by FAO and the African Union Commission (AUC) in 2018. It calls for consideration of socioeconomic issues around access and use of agricultural technologies by small-scale farmers, women and youth. It aligns with the AUC initiative of "retiring hoe to the museum"[5].

5. Mechanization covers all levels of farming and processing technologies, from basic handheld tools to more sophisticated and motorized equipment. It eases and reduces hard labour and relieves labour shortages. It improves productivity and timeliness of agricultural operations and the efficient use of resources. Additionally, it enhances market access and value addition, reduces post-harvest losses, contributes to mitigating climate-related hazards and creates job opportunities. Sustainable

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[1] FAO. 2023. Global Conference on Sustainable Agricultural Mechanization (GAMC) Introduction Call to Action.

[2] FAO. 2023. The status of women in agrifood systems. Rome. https://doi.org/10.4060/cc5343en

[3] FAO. 2021. Will promotion of agricultural mechanization help prevent child labour? Policy brief. Rome. FAO

[4] Rigillo, Nicholas. "First-ever FAO Global Conference on Sustainable Agricultural Mechanization opens in Rome". FAO, September 27, 2023. *https://www.fao.org/newsroom/detail/first-ever-fao-global-conference-on-sustainable-agricultural-mechanization-opens-in-rome/en*

[5] African Union Unveils a statue "Retiring the Hoe to the Museum" to Launch a Continental Agenda to Improve Agriculture Mechanization among Women Farmers. AU press release, October 21, 2019. *https://au.int/en/pressreleases/20191021/african-union-unveils-statue-retiring-hoe-museum-launch-continental-agenda*

mechanization considers technological, economic, social, environmental and cultural aspects when contributing to the sustainable development of the agrifood sector.

6.   Mechanization is necessary to transform Africa's agrifood systems. However, except for North Africa, the level of agricultural mechanization in sub-Saharan Africa remains low, and the reliance on human labour, a significant part of which is provided by women, remains far too high. It is estimated that about 65 percent of farm power is still provided by human muscles and the rest by draught animals (25 percent) and engine power which contributes only about 10 percent. "Sustainable agricultural mechanization: a framework for Africa" (FAO & AUC, 2018)[6].

7.   One of the resolutions under Commitment III of the *Malabo Declaration* identifies agricultural mechanization as a key factor in achieving the target of doubling agricultural productivity levels by 2025. Specifically, the resolution calls for creating and enhancing appropriate policies, institutional conditions and support systems to facilitate "suitable, reliable and affordable mechanization and energy supplies […]."

8.   Owing to increased investments by governments, supported by a variety of local and international partners, there is currently a growing uptake of mechanization across some value chains. This is also spurred by the rise in rural-urban migration (which has led to labour shortage in rural areas), the heightened demand for processed agricultural goods and a surge in the number of medium-scale farms. These changes have contributed to a growth in the number of local private sector organizations engaged in mechanization-related activities, such as machinery hire services. There is increased engagement of both global machinery manufacturers and smaller companies in the African market, supplying both used and new machinery. "Animal traction, two-wheel tractors, or four-wheel tractors? A best-fit approach to guide farm mechanization in Africa" (Daum et. al, 2023)[7]. Across Africa, local manufacturing sectors are also progressively widespread for simple types of equipment. "*An evolving paradigm of agricultural mechanization development: How much can Africa learn from Asia?*" (Diao et. al, 2020)[8].

9.   Globally, mechanization has evolved from the use of basic tools requiring full manual power, to animal traction and human-operated mechanized tools (e.g. regular tractors), to fully autonomous or semi-autonomous, digitally enabled machinery such as drones or self-driving combine harvesters. "The State of Food and Agriculture 2022. Leveraging automation in agriculture for transforming agrifood systems" (FAO, 2022)[9]. While in its infancy, digitally enabled mechanization has emerged in Africa as well, thanks to the expanding penetration of digital connectivity. For example, promising innovations include solar-powered irrigation technologies, which offer an affordable combination of sustainable agriculture mechanization and digital technologies, and small-scale processing machineries, which provide sustainable mechanization for income generation for smallholder farmers, rural women and youth.

1.2.2.   *Evolution of digitalization*

10.   Digital technologies and solutions refer to electronic tools, systems, devices and resources that help to generate, store, process data and facilitate interactions, from the computer to mobile phone, and

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[6] FAO, AUC (2018) Sustainable agricultural mechanization: a framework for Africa. Food and Agriculture Organisation, Rome, and African Union Commission, Addis Adaba. http://www.fao.org/3/CA1136EN/ca1136en.pdf

[7] Daum, T., Seidel, A., Awoke, B., & Birner, R. (2023). Animal traction, two-wheel tractors, or four-wheel tractors? A best-fit approach to guide farm mechanization in Africa. Experimental Agriculture, 59, E12. doi:10.1017/S0014479723000091

[8] Diao, X., Takeshima, H., & Zhang, X. (2020). An evolving paradigm of agricultural mechanization development: How much can Africa learn from Asia?. Intl Food Policy Res Inst.

[9] FAO. 2022. The State of Food and Agriculture 2022. Leveraging automation in agriculture for transforming agrifood systems. Rome, FAO. https://doi.org/10.4060/cb9479en

from drones to artificial intelligence systems. As highlighted in the Digital Agriculture Strategy of the African Union, they have transformative potentials for agriculture productivity, performance, efficiency and rejuvenation.

11.   Digital technologies are continually evolving on the continent. "Status of digital agriculture in 47 sub-Saharan African countries" (FAO, 2021)[10]. According to the International Telecommunications Union and World Bank data (World Bank, 2023)[11], mobile cellular subscriptions in sub-Saharan Africa surged from 59 percent in 2012 to 89 percent in 2022. A quarter of the population now accesses the internet via their mobile phones, marking a gain of nearly 30 million new mobile internet users in 2022, and signifying a 17 percent growth in users over the past five years. Although an urban-rural digital divide persists, it appears to be narrowing; the ratio of urban to rural internet users has increased from 4:1 in 2019 to 2.8:1, at present.

12.   Agriculture production is being remodelled by integrating technologies such as sensors, spatial and temporal data, and artificial intelligence. Digital applications have enabled the emergence of new business models for tractor use through shared and on-demand services. This is easing access to mechanization services for smallholder farmers and their cooperatives, while offering the opportunity to leverage useful data to plan production activities. The use of drones is improving the efficiency and productivity of farm management, revolutionizing the spraying of fertilizers or pesticides, farm monitoring, and facilitating access to alternative finance through data that may confirm producers' creditworthiness.

13.   Digital technologies in irrigation have revolutionized farming systems. Water pumps are managed remotely and acquired data are improving water use efficiency, therefore easing climate change impact on the productivity of different crops. FAO and partners have developed the Water Productivity Open-access Portal (WaPOR), a remote sensing for water productivity software. This technology is a publicly accessible near real-time database that uses satellite data and allows the monitoring of agricultural water productivity at different scales.[12]

14.   Market access is also being ramped up through facilities such as e-commerce sites, including those based on social media, such as Facebook or WhatsApp Business. "*Digital Opportunities for Better Agricultural Policies*,(OECD, 2019)[13]. More sophisticated platforms are connecting producers to processors, retail sellers and agrodealers, building on close to just-in-time processes enabled by digitalization. The importance of these innovative tools for trade has led the African Union to plan an e-commerce protocol for the African Continental Free Trade Area(AfCFTA), which will guide governments on issues including e-trade barriers, e-logistics, cross-border e-payment facilitation, cybersecurity and data protection.

15.   Digital technologies are helping to enhance public service and social protection delivery. FAO has supported countries in Africa to strengthen social protection registries and information systems to expand and improve the delivery of benefits to rural populations. For example, countries are increasingly using farmer registries – as well as registries of those working in sectors such as fisheries and forestry – to develop and deliver tailored policies to small-scale food producers and vulnerable rural populations. "Farmer registries and social protection information systems: Harnessing interoperability to improve outcomes for rural populations (Barca, V. and Hebbar, M. 2023))[14]. Early-warning information systems and climate forecasting are used to make social protection systems climate-smart and shock-responsive across the continent. FAO's 1000 Digital Villages Initiative (DVI) is also being leveraged across Africa

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[10] FAO. 2021. Status of digital agriculture in 47 sub-Saharan African countries. Rome. FAO

[11] World Bank. 2023. *Data*. https://data.worldbank.org

[12] https://www.fao.org/in-action/remote-sensing-for-water-productivity/en

[13] OCDE. 2019. *Digital Opportunities for Better Agricultural Policies*. OECD ed. Paris https://doi.org/10.1787/571a0812-en

[14] Barca, V. and Hebbar, M. 2023. Farmer registries and social protection information systems: Harnessing interoperability to improve outcomes for rural populations. FAO and GIZ, Rome and Bonn.

to accelerate digital rural transformation, through support for the adoption of farm and non-farm digital services. "*Global Conference on Sustainable Agricultural Mechanization (GAMC) Introduction Call to Action*" (FAO, 2023b)[15]

16.   The newly developed African Union's Digital Agriculture Strategy aims to guide governments on how to leverage digital solutions for sustainable agricultural transformation. Countries like Kenya and Nigeria are leading the way with policies supporting digital agriculture innovations.

1.2.3.   Benefits for women and youth

17.   Sustainable and modernized agricultural mechanization has the potential to provide vital benefits to women and youth involved in agrifood systems; it can reduce drudgery in agricultural work, which is disproportionately experienced by women, freeing their time and labour for other livelihood engagements, in addition to improving productivity for their agricultural activities. Mechanization can reduce women's dependence on male labour, allowing them to engage in the production of crops traditionally cultivated by men and to enter new value chains. "The s*tatus of women in agrifood systems*" (FAO, 2023[16].

18.   Sustainable mechanization can also empower women and youth as operators of machinery and equipment, as staff of mechanization hiring services businesses (offering their service to others to earn an income), or as entrepreneurs managing their own mechanization hiring services targeting other farmers as clients. "Status of digital agriculture in 47 sub-Saharan African countries" (FAO, 2021)[17]. For example, hundreds of young men and women have become tractor operators or mechanization agents for on-demand services – such as those offered by Hello Tractor in Kenya and Nigeria, or TROTRO Tractor in Ghana – while many other countries are lagging.

19.   The Framework for Sustainable Agriculture Mechanization in Africa launched by the AUC in collaboration with FAO in 2018 considers the inclusion of women and youth as one of the key components of sustainable mechanization. "Sustainable agricultural mechanization: a framework for Africa" (FAO and AUC, 2018[18]. Innovative initiatives on inclusive mechanization implemented in the continent showed the importance of targeting them for capacity building, technology dissemination and facilitating access to credit to support the adoption of or engagement in mechanization. "The impact of mechanical maize planter on smallholder women farmers in Burkina Faso" (Harrigan and Jones, 2020)[19]. The Agricultural Technical Vocational Education and Training for Women programme, implemented by the African Union Development Agency, trained women in the operation, maintenance and management of farm tractors and other agriculture machineries; they have become service providers, helping to dismantle negative stereotypes about women's role in mechanization. "Empowering women

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[15] FAO. 2023. *Global Conference on Sustainable Agricultural Mechanization (GAMC) Introduction Call to Action*.

[16] FAO. 2023. The s*tatus of women in agrifood systems*. Rome. https://doi.org/10.4060/cc5343en

[17] FAO. 2021. Status of digital agriculture in 47 sub-Saharan African countries. Rome. FAO

[18] FAO, AUC (2018) Sustainable agricultural mechanization: a framework for Africa. Food and Agriculture Organisation, Rome, and African Union Commission, Addis Adaba. http://www.fao.org/3/CA1136EN/ca1136en.pdf.

[19] Tim Harrigan and Maria Jones, 2020. The impact of mechanical maize planter on smallholder women farmers in Burkina Faso, success story technical report, appropriate scale mechanization consortium.

through mechanisation: Where are the opportunities?" (Cele, Adelfang-Hodgson, Boateng and Abio, 2020)[20].

20.   Beyond mechanization, digitalization also leverages important benefits to youth and women engaged in rural and agricultural activities. It unleashes their potential as key contributors, fostering innovation, increasing productivity and expanding access to essential resources and services in rural communities.

21.   Women, often sidelined in many traditional agricultural set-ups, use digital tools to access information and markets, and to trade their produce through mobile phones. Mobile SMS-based channels that provide real-time market information and e-market place facilitate a more transparent market, with fair market price. Digital advisory services can reach women living in remote locations or women whose mobility is restricted because of unpaid domestic and care work or social norms, and link women farmers and processors with input suppliers and markets for their produce.

22.   Women and youth, who might have previously been excluded from formal banking systems, now have avenues to secure funding for their agricultural investments through various mobile financial schemes. Mobile finance increases women's access to financial accounts and improves their control over their finances. "Gender and ICTs: Mainstreaming gender in the use of information and communication technologies (ICTs) for agriculture and rural development" (FAO, 2018)[21]. Mobile money may further enable women's access to credit from formal banks through providing a traceable digital financial record based on their mobile money operations.

1.3. Persistent gaps in sustainable and inclusive access to agriculture mechanization and digitalization

23.   Despite the progress made in mechanization in the continent, key gaps persist in terms of sustainable access to mechanization and inclusion of women and youth. Overall, women lag behind men in accessing and using mechanization, and their farms use less agriculture machinery compared to farms managed by men. Female-headed households are less likely to own mechanized equipment than male-headed households. Data shows that the gender gap in mechanization over the past few years is widening, instead of narrowing down. "The *status of women in agrifood systems"* (FAO, 2023)[22].

24.   There are several reasons behind the gender gap in mechanization. Most agricultural innovations and machinery do not cater for the needs and preferences of women farmers; machinery and tools tend to be developed and designed with male farmers and workers in mind, and they often need to be adjusted to make them suitable for women's body size and physical strength.

25.   Women are not usually targeted in technology communication and do not receive firsthand information about agricultural technologies. There are often negative sociocultural perceptions associated with women using and operating agricultural machinery; intra-household decision-making processes also affect the adoption of technologies by women.

26.   Youth and women farmers and agripreneurs, particularly smallholder producers and processors, have limited access to capital to purchase agricultural machinery. Procuring modern machinery and equipment is expensive, and many young and female entrepreneurs lack the financial resources or access

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[20] Cele, L., Hodgson, I.A., Boateng, M. and Moses, E., 2020. Empowering women through mechanisation: Where are the opportunities?

[21] FAO. 2018. Gender and ICTs: Mainstreaming gender in the use of information and communication technologies (ICTs) for agriculture and rural development, by Sophie Treinen and Alice Van der Elstraeten. Rome, Italy

[22] FAO. 2023. The *status of women in agrifood systems*. Rome. https://doi.org/10.4060/cc5343en

to credit facilities to make these investments. Limited access and ownership of productive assets, such as land, and low financial literacy reduce their creditworthiness in the eyes of formal financial institutions. Service providers have made agriculture mechanization more accessible to smallholder farmers; however, most machinery service providers in rural areas are men, which limits women's opportunity to learn about the services or access service providers.

27.   In the last decades, despite the increase in digital agricultural products and services, many of these are not sufficiently reaching women. Many existing information and communications technology solutions for agriculture have a low proportion of women users compared to men. This is due to structural inequalities, including women's lower income status, literacy, digital skills and unequal access to services – be it extension, business development or financial services. Women have low ownership of mobile phones and access to the internet, and limited experience of using digital tools for agriculture. For example, women in sub-Saharan Africa are 13 percent less likely than men to own a mobile phone, and 37 percent less likely than men to use mobile internet. "The Mobile Gender Gap Report" (GSMA, 2022)[23]. The cost of digital devices and mobile data and social norms that restrict women's use of the internet present obstacles for women to benefit from digital agriculture services.

1.4.   Potential for concrete actions and recommendations

28.   Mechanization and digitalization interventions in Africa need to be tailored to local contexts and aligned with national long-term agricultural and economic development plans. For a sustainable and coordinated approach to mechanization, based on the ten elements of F-SAMA, it is necessary to establish a formal network for the Directors/Heads of Agricultural Mechanization and Engineering Services (DAMES/HAMES) on the continent. Collaboration among the DAMES will help to resolve the many challenges that have caused continued stagnation and decline in agricultural mechanization in Africa.

29.   Effective adoption and scale-up of sustainable agricultural mechanization in Africa require substantial political and financial commitment from both governments and the private sector. The "AfricaMechanize" platform[24] has been established as the core platform for exchanges on all aspects of the development and promotion of sustainable agricultural mechanization in Africa, including tracking the implementation of F-SAMA. This platform must be owned and supported by African governments.

30.   Sustainable agricultural mechanization has a potential to create on-farm and off-farm employment opportunities for young people and to empower women. To realize scale there is need for youth and women targeted actions, such as:

  a. The provision of targeted training programmes designed to build the capacity of women and young people to gain access to mechanization services and technologies, and to operate and maintain equipment effectively and profitably.

  b. The introduction of vocational education and training. Given the shift to more knowledge-intensive farming and post-harvest handling operations in the region, vocational education and training is imperative to equip youth to take on critical roles in the emerging competitive agriculture and value-adding activities. Several incubation hubs are helping youth add value to their produce, such as the Uganda Industrial Research Institute.

  c. The design and development of women-friendly mechanization technologies, capacity development programmes and support systems to provide mechanization services. In favour of women's access to sustainable mechanization, there is a need for tailor-made innovations, solutions and business models driven by demand.

  d. Undertaking complementary interventions, such as reskilling programmes and social protection to support those who have lost livelihood opportunities, with the introduction of

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[23] GSMA, 2022. The Mobile Gender Gap Report 2022
[24] www.africamechanize.org

modern technologies, in situations where the mechanization of traditionally female-dominated value chains has displaced women's labour.

e. The general need for government and private sector investments in enabling infrastructure, including energy and digital infrastructure, and improving access to rural services (e.g. finance, insurance and education), including expanding coverage of social protection to rural areas to enhance access to digital technologies by small-scale agriculture producers, youth and women farmers. Governments also need to implement sound digital agriculture and data policies and strategies, including on modern technologies, such as artificial intelligence.

f. The need for government and private sector service providers to facilitate affordable connectivity for poorer communities, and improve the availability of sex-disaggregated data and gender-related statistics that capture digital gender gaps in rural areas, to better inform policy and business decisions to address these gaps, set targets and track progress.

g. The need to invest in digital literacy to enable smallholders, rural youth and women to reap the benefits of digitalization and reduce the persisting usage gap. The development of digital skills is necessary to increase awareness and understanding of digital technologies, disposition to use them, as well as proficiency in terms of cognitive and practical skills to operate online.

h. Ensuring that the content and format of digital products and services are relevant and accessible to women farmers to improve women's access to digital services and products . The content needs to take into account gender roles in agriculture value chains and provide tailored services that respond to the diverse needs of women, youth, and men working in the various agrifood value chains. The format of communication should consider literacy levels. These objectives can be achieved by adopting a participatory, inclusive design approach that considers age, education and other factors that might restrict users from using digital products and services; develops solutions to address the constraints; and tracks users to evaluate inclusivity.

i. The need to engage men, women, youth, and communities to shift social norms that restrict women's use, to enable women to access and use machinery and digital tools services. Joint targeting of men, women, and young agricultural producers from the same household during the promotion of digital products and services and agricultural machinery helps to improve the adoption of such technologies by men, women and youth. It also helps to avoid backlash or resistance due to restrictive social and gender norms.

II.   Objectives of the Session

31.   The Ministerial Roundtable will provide a platform for Members and other key stakeholders to discuss concrete examples of measures or best practices used by African countries to promote inclusive access to productive resources (land, water and energy), agriculture mechanization and digitalization in their countries, and to propose concrete actions.

III.   Expected Outcomes

32.   A shared understanding and recognition of the importance of making inclusion a core policy objective in ongoing national agricultural mechanization and digitalization efforts.

33.   A shared commitment to create an enabling environment for inclusive mechanization and digitalization, and to allocate financial resources to support women and youth to take advantage of and equitably benefit from these opportunities.

34.   Recommendations and guidance to FAO to enhance its support to Members on inclusive mechanization and digitalization, specifically to provide technical support in developing and implementing gender- and youth-responsive national policies, regulations and laws on sustainable agricultural mechanization and digitalization.

IV.   Target audience / Participants

33.   The target audience will include Ministers for Agriculture, Gender, Trade and Industry, the African Union Commission, international and national organizations, national and international experts, non-government organizations/civil society organizations, farmer representatives and other invited participants.

V.   Agenda

5 minutes	Introduction	Moderator – FAO
10 minutes	Presentation:	FAO Deputy Director-General
45 minutes	Ministerial Panel discussion (each country will present what they have done on inclusive agricultural mechanization and digitalization)	• Ministers from Member Nations • Representatives of partners and other relevant stakeholders
30 minutes	Plenary discussion – continued sharing of good practices	Members and participants: • Women in digitalization/ mechanization • Youth in digitalization/mechanization • Representatives of women farmers associations or agripreneurs
10 minutes	Wrap-up and concluding remarks	Moderator – FAO