

**(06-027) - Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation Project. Evidence from Agatobwe Marshland Reclamation in Rwanda.**

HABUMUGISHA, VINCENT <sup>1</sup>; Carmenado, Ignacio De Los Ríos <sup>1</sup>

<sup>1</sup> Universidad Politécnica de Madrid

Community resilience is the backbone of rural development. The Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project aimed at addressing community resilience and sustainable food security in Nyaruguru District in Rwanda. Taking Agatobwe marshland reclamation as a case study, this study aimed to assess, from the WWP model, the influence of the social systems, and the interplay of various technical-entrepreneurial, ethical-social, and political-contextual strategies. Semi-structured interviews were conducted with farmers. Results show that marshland reclamation activities contributed to local food security and built community resilience. Civil society gained a high influence through infrastructural development, capacity strengthening, and capital flow. The technical-entrepreneurial, ethical-social, and political-contextual strategies interplayed to increase food security, community resilience, and enhanced social learning. It is recommended that the private sector system be strengthened to play its role in agriculture development adequately. Livelihood diversification and crop insurance are also recommended to safeguard community resilience in the face of climate change.

Keywords: Sustainability; Food Security; Rural Development; Resilient Communities, Smallholder Farmer Cooperatives; Capacity Strengthening

**Alianzas de Mercado Sostenible y creación de comunidades resilientes:  
Evidencias desde Agatobwe Marshland Reclamation (Ruanda).**

La resiliencia de las comunidades es la columna vertebral del desarrollo rural. El proyecto Alianza de Mercado Sostenible y creación de Comunidades Resilientes (SMART) tiene como objetivo abordar la resiliencia comunitaria y la seguridad alimentaria sostenible en el distrito de Nyaruguru en Ruanda. La investigación, tomando el caso la recuperación de las marismas de Agatobwe, evalúa desde el modelo WWP, los sistemas sociales y la interacción de las diversas estrategias técnico-empresariales, ético-sociales y político-contextuales. Los resultados muestran que las acciones para la recuperación de marismas contribuyeron a la seguridad alimentaria local y la generación resiliencia comunitaria. La sociedad civil asumió en el proyecto una gran influencia a través del desarrollo de infraestructura, el fortalecimiento de capacidades y el flujo de capitales. La interacción de estrategias de las dimensiones técnico-empresariales, ético-sociales y político-contextuales permitieron aumentar la seguridad alimentaria, la resiliencia comunitaria y mejorar los procesos de aprendizaje social. El fortalecimiento del sector privado es un desafío aún pendiente para que desempeñe adecuadamente su papel en el desarrollo rural. También se recomienda la diversificación de los medios de vida y los seguros de cosechas para la resiliencia de las comunidades frente al cambio climático.

Palabras clave: Sostenibilidad; Seguridad alimentaria; Desarrollo rural; Comunidades Resilientes, Cooperativas de pequeños Agricultores; Fortalecimiento de capacidades

Correspondencia: Names: Vincent HABUMUGISHA, E-mail: vincenthaba@yahoo.fr



©2024 by the authors. Licensee AEIPRO, Spain. This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

The United Nations set ambitions to end food insecurity, hunger, poverty, and malnutrition in all its forms by 2023. The agriculture food systems responding to food security and nutrition needs are being challenged by growing inequities, conflict, economic contraction, climate variability, and extremes among others (FAO, IFAD, UNICEF, WFP and WHO, 2023). Furthermore, Food security being pivotal in achieving sustainable development of communities in the developing world is being challenged by food availability, stability, and economic factors (Dehrashid, et al., 2021) land shortage (Rwabukambiza, 2022), poverty, land degradation, and shortage of rainfall with rural areas being the most hit in Central America, Asia and Africa (Agidew & Singh, 2018; Thornton, Loboguerrero, Campbell, Kavikumar, & Shackleton, 2019).

Agrifood markets play a vital role in food access. Markets allow the exchange of products and services between buyers and sellers and are shaped by practices and actors (Matt, 2023). Market access by farmers allows them to increase sales and income (Ume, 2023). However, farmers may be limited by low production surplus for sale and limited access to markets (Sebatta, Mugisha, Katungi, Kashaaru, & Kyomugisha, 2014). Factors influencing market access include physical access to the market, farmer skills (Magingxa, Alemu, & Schalkwyk, 2009) and knowledge (Magesa, Michael, & Ko, 2020). Issues related to the lack of market information include oligopolistic market systems, information and communication technology, gender limitations, and the lack of market infrastructure which lead to inefficient agriculture markets, harm market actors, and cause negative social-economic effects (Nugroho, 2021). Improved information capabilities empower farmers in agriculture marketing (Magesa, Michael, & Ko, 2020) and market orientation has a positive effect on farmers' income (Ume, 2023).

Community resilience is the pillar of rural development in the face of changing climate and natural disasters. Walker, Holling, Carpenter, & Kinzig (2004) and (Folke, et al.(2010) defined resilience as “the ability of socio-ecological systems (SES) to persist within critical thresholds despite continuous modification and adaption”. In the context of resilience to disasters, communities are classified into three categories (Räsänen, Lein, Bird, & Bird, 2020): (a) place-based community, which is an administrative unit geographically defined, (b)interaction-based community characterized by social networking and interactions driven by the existing social capital, and Community of practice and interest characterized by collective reaction of organized regular interactions of actors. This community conceptualization underpins the understanding of knowledge transmission, community development, or social learning (Barrios, 2014; Xu, Xiang, & Proverbs, 2020; Zhong, et al., 2020; Zaman & Raihan, 2023). Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum (2008) defined community resilience as “a process linking a set of networked adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance while the UNISDR (2013) defined the community resilience as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the

preservation and restoration of its essential basic structures and functions”. The set of capabilities and dynamic processes constitute the shared community resilience framework (Zaman & Raihan, 2023).

Rural development is the outcome of interactions. The development of rural areas results from the interaction between rural asset distribution, incentive structures, institutions and organizations, and linkages to the non-rural realm (Lakshmanan, 1982). Asset distribution includes landownership and physical and human capital (Lakshmanan, 1982). Incentive structures include subsidies, investments, procurement, and wages. External linkage to non-rural rural areas includes national, international, and other rural-urban linkages which for instance facilitate the supply of agriculture inputs that rural farmers need to increase their agriculture production (Lakshmanan, 1982). Organizations and institutions are public and private and link rural residents with needed production and consumption facilities (Lakshmanan, 1982). The organization-institution subsystem affects both asset distribution and incentives. Assets, incentives, institutions and organizations, external linkage coupled with the participation of rural residents fosters rural development. On the other hand, the Working With People (WWP) model was also proved to be a rural development model (Cazorla, De los Ríos, & Salvo, 2013; Nicolás, 2016). It integrates (1) the ethical–social component covering attitudes, behaviors, and interactions of people delivering the project, (2) the technical–entrepreneurial component covering key elements to generate project outputs, (3) the political–contextual component which looks at the suitability of the project into political and development priorities and agendas in a territory (Cazorla, De los Ríos, & Salvo, 2013; Nicolás, 2016). The three components integrate political, public administration, civil society, and private and entrepreneurial fields into a synthesis of the society model and integrate into social learning which empowers actors toward rural development (Cazorla, De los Ríos, & Salvo, 2013; Nicolás, 2016).

Politics and governance influence community resilience. Local politics and governance, inequalities and social justice, and gender roles and agency are understudied and there is a gap in empirical evidence of their influence on community resilience (Zaman & Raihan, 2023). Therefore, there is a need to understand power relations, political dynamics, and human agency in strengthening community resilience to natural shocks. Government support for community resilience to natural shocks is limited to policy and action program design (Nurzaman, Shaw, & Roychansyah, 2020; Uddin, Uddin, Walker, & Choudhury, 2020; Yoon, Kang, & Brody, 2015). Therefore, there is a need to know the influence of local politics and public administration on community resilience (Zaman & Raihan, 2023). Marginal people are deprived of public goods by the local power elites (Choudhury & Haque, 2016), and thus, research is needed in this area (Zaman & Raihan, 2023). Integration of expert and local knowledge is important for governance and community resilience-related decision-making (Beauchamp, Hirons, Brown, & Milner-Gulland, 2020) and research found the significance of local and informal knowledge in community resilience (Zaman & Raihan, 2023). In addition, women are more vulnerable to natural shocks than men, however, there is a knowledge gap of gender on community resilience (Zaman & Raihan, 2023). Furthermore, the negative effects of natural shocks are socially differentiated (Adger, 2003). Therefore, there is a need to understand how equity and social justice are ensured in designing and implementing community resilience interventions.

### **1.1. Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project**

The United Nations World Food Programme (WFP) and the government of the Republic of Korea through the Korea International Cooperation Agency (KOICA) implemented the “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project “ (WFP, 2020). The project was implemented between 2020 and 2023 with a budget of USD 8 million aiming at building resilience of the communities and ensuring sustainable food security (WFP, 2020) in five districts in Rwanda. Project interventions focused on creating climate-resilient community assets such as marshland rehabilitation, land terraces, and improved small-scale irrigation systems to build the community's resilience to natural shocks such as flooding, landslides, and drought (WFP, 2020). Community asset creation restores food security and nutrition, and livelihoods, and builds community resilience following shocks in food-insecure communities (WFP, 2016). Resilience programs encompass transferring technical skills and knowledge to communities in land rehabilitation, water conservation, agricultural production and diversification, and marketing (WFP, 2016).

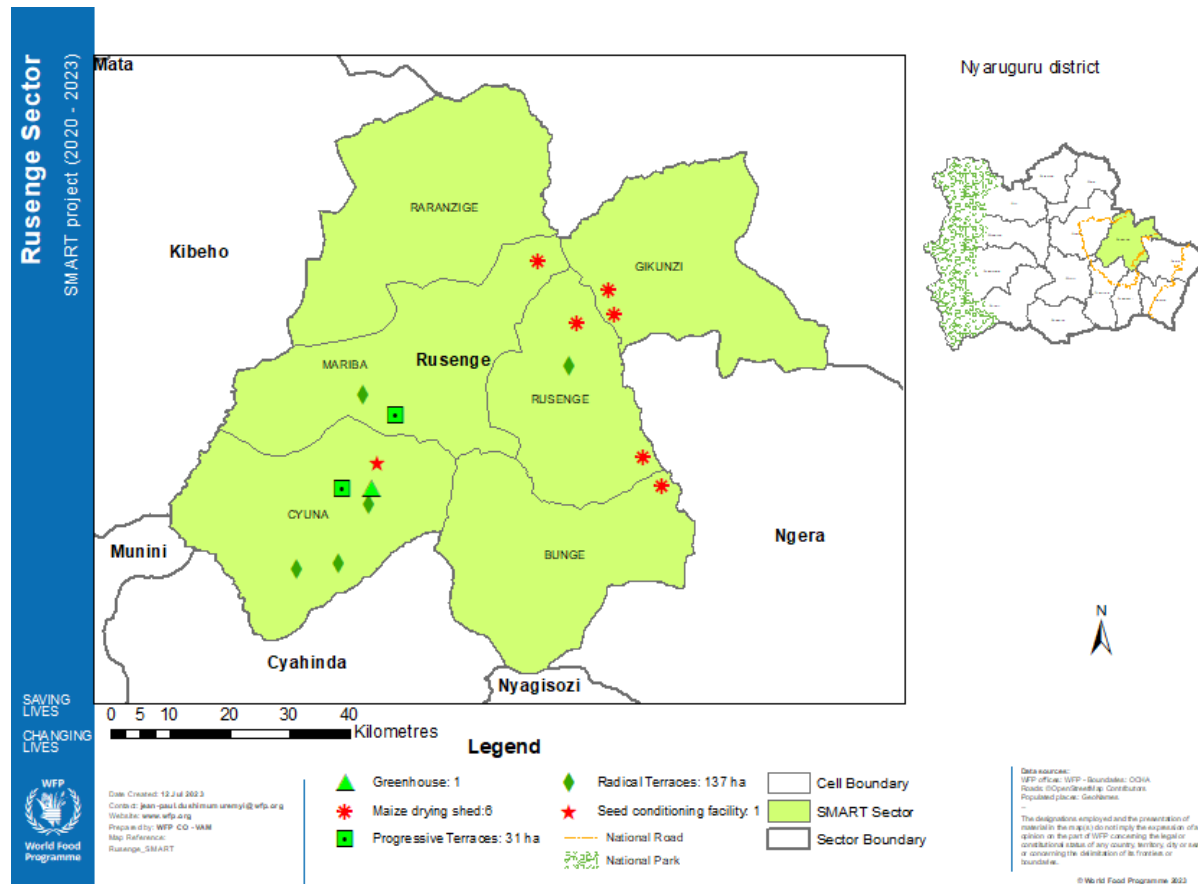
The “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project” was aligned with various policies and models. The project design was built on the South Korean rural development model and aligned with Rwanda’s Vision Umurenge Programme (VUP) (WFP, 2020). The VUP aims to speed up economic transformation through job creation, economic growth, and extreme poverty reduction using a participatory approach (LODA, 2024). The project was also aligned with “WFP’s asset creation and smallholder farmer market support model to improve household food security and enhance community resilience”, the Government of Rwanda’s National Strategy for Transformation (NST, 2017–2024), the Ministry of Agriculture and Animal Resource’s (MINAGRI) Strategic Plan for Agriculture transformation 2018 – 2024 and Social Protection Sector Strategic Plan 2018/2019 -2023/2024 (WFP, 2020).

The reclamation of the Agatobwe marshland is one of the created community assets under the “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART)” Project. Agatobwe marshland is in Nyaruguru District in the Southern Province of Rwanda. Marshland reclamation activities included the construction of irrigation schemes, land levelling and plotting to increase land available for agriculture coupled with the provision of agriculture inputs, forming small-holder farmer cooperatives and training members on good agriculture practices and post-harvest handling and storage, capacity building for government officials, gender and nutrition training and awareness and mobile creche to care of children for mother to participate in project activities.

The SMART project was relevant in Nyaruguru District. The poverty level is higher in rural than in urban areas in Rwanda. In the study conducted by the World Bank in Rwanda in 2015, above 90% of the poor lived in rural areas and depended on farm wage labour or subsistence farming to make a living (The World Bank Group, 2015). Poverty was concentrated in the southwest part of Rwanda (The World Bank Group, 2015). According to Rwanda - Comprehensive Food Security and Vulnerability Analysis 2021, Nyaruguru District located in the Southern Province was among food insecure districts with low dietary diversity and a high food expenditure share whereby households spend more than 65% of their budget on food making them highly economically vulnerable to accessing food and less economically resilient to cope with any other shocks affecting household livelihoods (NISR, 2021). Nyaruguru District is also affected by natural disasters (NISR, 2021). Factors contributing to food insecurity include land ownership and land size, livestock ownership, household head characteristics, and household size (NISR, 2021).

While the SMART project success was achieved, there is a knowledge gap on its contribution to local food security, compliance with the principles for responsible investment in agriculture and food systems, the influence of the social system, and the interplay of various technical-entrepreneurial, ethical-social, and political-contextual strategies on food security in the context of Rwanda. Furthermore, there is a knowledge gap about the integration of experiential and expert knowledge to enhance social learning beyond the project scope. Taking Agatobwe marshland as a case study, therefore, this study aimed to generate evidence to pave the way for relevant recommendations.

**Map 1: Location of the “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART)” activities in Nyaruguru District.**



**Source:** Assets Handover Report (WFP and Nyaruguru District, 2023)

## 2. Materials and methods

Key informant interviews were conducted with 71 members of the three cooperatives farming in the Agatobwe marshland. The respondents are members of the executive committees (12 people), audit committees (7 people), zone leaders (23 people), and 29 lead farmers. Semi-structured questionnaires were used to collect information using open and closed questions. Questionnaires are suitable tools to collect information about perception (Boynton & Greenhalgh, 2004; Hargreaves & Seale, 2006) which is the case for this study. Semi-structured questionnaires were also used by Cazorla, Ríos, & Salvo, (2013) in their study “Working With People (WWP) in Rural Development Projects: a Proposal from Social Learning”. Questionnaires were also used by Agidew & Singh, 2018; Rwabukambiza, 2022; and Dehrashid, et al.(2021). The questionnaire

was divided into three main parts: The yield for main crops (maize, beans, and Irish potatoes), implementation of the Principles of Responsible Investment in Agriculture and Food Systems, and strategies to increase agriculture production using the “Working With People-WWP” framework. The “Working With People” model combines technical-entrepreneurial, ethical-social, and political-contextual components with an integrative social learning component to integrate expert experiential knowledge, and values of the people involved to deliver the project (Cazorla, De los Ríos, & Salvo, 2013). The “Working With People” model is related to the Principles of Responsible Investment in Agriculture and Food Systems (CFS-RAI) framework as the latter considers social, economic and environmental aspects of agriculture and food systems which are engrained in the technical-entrepreneurial, ethical-social, and political-contextual components of agriculture and food systems. Therefore, the “Working With People” model can be used to analyze the implementation of Principles of Responsible Investment in Agriculture and Food Systems (CFS-RAI), and other sustainable rural development interventions (Aliaga, Ríos-Carmenado, Howard, Espinoza, & Cristóbal, 2022). The Likert scale was used, and the level of agreement and influence were given the following values: 1 strongly disagree/ not at all influential, 2 disagree/ slightly influential, 3 neutral/ somewhat influential, 4 agree/ very influential and 5 strongly agree/extremely influential (Vagias, 2006). Mean score analysis was used to rank variables.

### 3. Results and discussions

This section presents the results of the study. The results are divided into four different subsections:(1) crop yield for main crops, (2) level of agreement on the implementation of the Principles of Responsible Investment in Agriculture and Food Systems, (3) influence of the social system on agriculture production and, (4) the influence of various technical-entrepreneurial, ethical-social, and political-contextual strategies and integrative social learning to influence food security in the Agatobwe marshland.

#### 3.1. Main crop yield

The table below summarizes data about the yield of the main crops (maize, beans and Irish potatoes) grown between 2017 and 2023.

Table 1: Main crop yield (metric tons/hectares)

Years	Maize (mt/ha)	Beans (mt/ha)	Irish potatoes (mt/ha)
2017-2018	-	-	26.2
2018-2019	2.9	-	-
2019-2020	-	-	28.5
2020-2021	3.4	1.6	-
2021-2022	5.5	-	18
2022-2023	2.84	1.4	24

Source: Rusenge sector agronomist (2024).

**Note:** Empty areas mean the crop was not grown in that particular year.

According to FAO, “Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2008; Gibson, 2012). Dimensions of food security include food availability, access, utilization, and stability (FAO, 2008; Gibson, 2012). Food availability is determined by the level of production, net trade, and stock level (FAO, 2008).

The reclamation of Agatobwe marshland increased agriculture production. Between 2017 and 2018, marshland reclamation activities hadn't started in the Agatobwe marshland. The recorded yield for the Irish potatoes was 26.2mt/ha. In the year 2018-2019, a yield of 2.9 mt/ha for maize was recorded. Until this period, marshland reclamation activities had not yet started. Marshland reclamation activities supported by the government and initially covering 18 hectares started in the year 2019-2020 and resulted in 28.5mt/ha of Irish potatoes. This is an increase of 2.3 mt/ha compared to the yield before any marshland reclamation activity in the year 2017-2018. In the year 2020-2021, marshland reclamation covered 36 hectares and maize yield increased to 3.4mt/ha compared to 2.9mt/ha in the year 2018-2019. In the same year, beans reached 1.6mt/ha. In the year 2021-2022, the SMART project expanded marshland reclamation activities to 72.5 ha and the yield for maize reached 5.5 mt/ha. Land reclamation activities were coupled with the provision of fertilizers and quality seeds. This is an increase in yield compared to 3.4mt/ha of the previous year. However, in the same year, the yield for Irish potatoes dropped to 18 mt/ha from 28.5 mt/ha in the year 2019-2020.

Farmers attributed the decrease in yield to poor-quality seeds from local seed suppliers, heavy rain, and crop diseases among others. In the year 2022-2023, while maize crop yield decreased to 2.84mt/ha, the beans yield to 1.4mt/ha, Irish potatoes yield increased to 24mt/ha. Farmers confirmed the decrease in yield was due to poor-quality seeds, heavy rain, and flooding. Negative impacts of poor-quality seeds and heavy rains on crop yield were also confirmed by Guo & Chen, 2022 and Omar, et al., 2023 in their studies. Impact of climate variability on food security was also confirmed by FAO, IFAD, UNICEF, WFP and WHO (2023). Overall, reclamation activities in the Agatobwe marshland increased crop yield for maize, beans, and Irish potatoes. Crop yield is positively associated with food security (Apanovich & Mazur, 2018).

### 3.2. Implementation of the Principles of Responsible Investment in Agriculture and Food Systems

The table below summarizes the data about the Implementation of Principles for Responsible Investment in Agriculture and Food Systems (RAI) during the SMART project implementation. The values of the level of agreement were converted into percentages.

Table 2: Ranking of the level of Agreement on the Implementation of Principles for Responsible Investment in Agriculture and Food Systems (RAI)

CFS-RAI Principles	N	Mean	Standard Deviation	Ranking
Promote safe and healthy agricultural and food systems	71	4.99	0.12	1
Incorporate inclusive and transparent governance structures, processes and grievance mechanisms	71	4.94	0.232	2
Enhance the participation and empowerment of young people	71	4.8	0.467	3
Promote gender equality and women's empowerment	71	4.77	0.54	4
Respect cultural heritage and traditional knowledge, and support diversity and innovation	71	4.76	0.494	5
Evaluate and address impacts and promote accountability	71	4.72	0.221	6



Respect tenure of land, fisheries, forests and access to water	71	4.62	0.704	7
Conserve and sustainably manage natural resources, increase resilience and reduce disaster risks	71	4.49	0.969	8
Contribute to economic development and poverty eradication	71	4.11	0.766	9
Contribute to food security and nutrition	71	4.01	0.643	10

\*The ranking is based on the mean score\*

Source: Data from key informant interviews.

Investments in food systems are a gateway to achieving food security, nutrition, and poverty reduction. With the rising food insecurity (The World Bank, 2024), investments in agriculture are a response to increase food production to mitigate hunger (FAO, 2014; Zhao & Chen, 2023) and to reduce gender inequality and poverty (Maisonnave & Mamboundou, 2020). Investments in agriculture lower food prices to increase food access, and income to make health services and nutritious food affordable (Mogues, Yu, Fan, & McBride, 2012). With the knowledge that large-scale investments in agriculture can cause environmental and social damage (Zhan & Speller, 2015), regulations, policies, and laws have to be in place to ensure those investments are socially, economically, and environmentally sustainable (OECD, 2013). The Food and Agriculture Organization of the United Nations outlined the above ten principles that should guide responsible investments. They cut across all the stages of agriculture value chains, apply to all sizes of agriculture investments, address all stakeholders, and provide actions to address economic, social, and environmental issues (FAO, 2014).

Smallholder farmers in the Agatobwe marshland confirmed the “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project” was implemented respecting the implementation of the principles for responsible investment in agriculture and food systems. Using the mean score analysis, promoting safe and healthy agricultural and food systems ranks first while a contribution to food security and nutrition ranks last.

The promotion of safe and healthy agricultural and food systems is highly ranked due to capacity strengthening on post-harvest handling and storage, coupled with related infrastructures like maize drying sheds which the SMART project provided to the stallholder farmer cooperatives. However, the contribution to food security and nutrition is the least ranked because though the project provided inputs and quality seeds in the first agriculture season following marshland reclamation activities which increased the yield, farmers in the subsequent seasons bought seeds from local suppliers and confirmed the seeds were of the poor quality which decreased the yield. Therefore, low crop yield is attributable to the poor quality of seeds from local suppliers and not from project interventions. Poor-quality seeds negatively affect crop yield as confirmed by Omar, et al.(2023) in their study.

Various specific project activities contributed to the overall implementation of the principles for responsible investment in agriculture and food systems (RAI). To name a few, the SMART project provided agriculture inputs to farmers in the first agriculture season following marshland reclamation activities. The inputs increased crop yield, contributing to food security and nutrition. Agriculture inputs, crop yield, and food security are positively correlated (Ahvo, et al., 2023). Following the marshland reclamation, the reclaimed land was given to people who did not have land. Farming is a source of livelihood to reduce poverty (Dixon, Gulliver, Gibbon, & Hall, 2001). In addition, the most vulnerable and poor were targeted by the project which is a strategy to reduce poverty (Walle, 1998). Mobile creches with nutrition support to children were established to create a safe space where mothers could leave their children and participate in project activities. This contributed to poverty reduction and women’s participation in employment (Broom,



2021). Young people participated in the project activities which resulted in job creation and income generation for the youth. Small-scale irrigation equipment was provided to ensure access to water for irrigation, new crops and vegetables were grown in the marshland, and farmers were trained on good agriculture practices and post-harvest handling and storage to promote safe and healthy agricultural and food systems. Community feedback mechanisms were put in place to ensure transparency and accountability (WFP, 2021).

To sum up, overall, there is a high level of agreement among smallholder farmers that the SMART project implementation followed the principles for Responsible Investment in Agriculture and Food Systems (RAI). This is a pathway to achieving sustainable food security and nutrition.

### 3.3. Influence of the social system on agriculture production.

The table below summarizes data about the influence farmers attributed to each of the social systems on agriculture production.

Table 3: Ranking of the influence of the social system on agriculture production.

Social systems	N	Mean	Standard Deviation	Rankin <sup>g</sup>
Civil society	71	4.97	0.167	1
Public	71	4.89	0.398	2
Political	71	4.79	0.476	3
Private business	71	4.06	0.984	4

\*The ranking is based on the mean score\*

Source: Data from key informant interviews.

Politics and governance influence community resilience. Social systems influenced agriculture production in the Agatobwe marshland. Farmers attributed the highest level of influence on civil society followed by the public administration system while the private-business system was ranked the least influential. Contrary, in their studies, Ríos, Rivera, & García (2016) found that the private-business system is the highest influencer of rural prosperity followed by civil society while Ickis(1983); Conyers and Kaul, (1990) highlighted the leading role of the political system in spearheading the success of rural prosperity projects (Ríos, Rivera, & García, 2016). Civil society gained a high influence because of the role of the Korea International Cooperation Agency (KOICA), the United Nations World Food Programme (WFP), Good Neighbors International Rwanda, and the Rwanda Rural Rehabilitation Initiative (RWARRI) in funding and implementing the project activities. The influence of the public administration and political systems is due to the involvement of the local government officials through monitoring project activities, forming and supporting farmer cooperatives and aligning their activities with the government initiatives, policies, and vision in addition to land provision. Farmers underplay the role of the private business system citing its inability to provide quality seeds which negatively affected crop yields in different agriculture seasons. Activities of the private initiative are linked to the selling of inputs and buying produce from cooperatives. Hence, social systems influence agriculture production and rural development differently depending on the context.

Conclusively, the perception of the high influence the civil society followed by public administration and political fields on agriculture production aligns with the findings of Lakshmanan (1982). He stated that the organizational-institutional subsystem has an influence on asset ownership

through integrated effects of changes in external linkages and incentives (Lakshmanan, 1982). In this case, the civil society field through capital flow, capacity strengthening, and infrastructural investment rehabilitated the Agatobwe marshland with the participation of local people. The reclaimed marshland became a productive community asset and local people were paid wages during their participation. The public administration and politics field got their influence through political ideology (Lakshmanan, 1982) which the European Environment Information and Observation Network (2021) defines as” a belief system that explains and justifies a preferred economic and governmental order for society, offers strategies for its maintenance or attainment and helps give meaning to public events, personalities and policies”.

### 3.4. Strategies to increase agriculture production.

The table below summarizes data about the farmers’ level of agreement on various strategies used to increase agriculture production.

#### 3.4.1. Technical-entrepreneurial strategies

The table below summarizes data about the level of agreement farmers attribute to technical-entrepreneurial strategies affecting agriculture production.

Table 4: Ranking of technical-entrepreneurial strategies.

Strategies	N	Mean	Standard Deviation	Ranking
Use of certified seeds	71	4.97	0.167	1
Use of chemical fertilizer	71	4.94	0.287	2
Pest and disease control	71	4.94	0.232	3
Timely land preparation and planting	71	4.93	0.258	4
Resource use efficiency	71	4.9	0.3	5
Entrepreneurship	71	4.87	0.412	6
Irrigation	71	4.87	0.375	7
Use of organic fertilizer	71	4.86	0.424	8
Farm profitability	71	4.85	0.467	9
Coherent vision and business strategy	71	4.82	0.425	10

\*The ranking is based on the mean score\*

Source: Data from key informant interviews.

Technical-entrepreneurial strategies influenced agriculture production in the Agatobwe marshland. Farmers highly ranked the use of improved seeds while coherent vision and business strategy were last ranked. The use of improved seeds is highly ranked as farmers believe recorded low yield in various agriculture seasons was due to bad quality seeds with low germination rates and resulted in low crop yield. This view is confirmed by Guo & Chen (2022) and Omar, et al. (2023) in their studies. Hence, the use of improved seeds, chemical fertilizers, and crop diseases and pest control are the main drivers of crop yield. Conclusively, the integration of key agriculture production elements constituting technical–entrepreneurial components made agriculture production possible. This aligns with the findings in a study conducted by Cazorla, De los Rios, & Salvo (2013).

### 3.4.2. Ethical-social strategies

The table below summarizes data about the level of agreement farmers attribute to Ethical-social strategies affecting agriculture production.

Table 5: Ranking of ethical-social strategies.

Strategies	N	Mean	Standard Deviation	Ranking
Skills and competencies	71	4.97	0.167	1
Good local governance and democratic processes	71	4.96	0.203	2
Equitable opportunities for all	71	4.96	0.203	3
Result orientation	71	4.94	0.232	4
Open attitude to cooperation and joint work	71	4.94	0.232	5
Mutual learning and knowledge exchange	71	4.93	0.258	6
Negotiation capacity of key actors	71	4.89	0.361	7
Trust between key actors and/or stakeholders	71	4.86	0.424	8
The community promotes and encourages diversity	71	4.86	0.457	9
A strong sense of belonging among the actors involved	71	4.85	0.402	10
Improved information and knowledge	71	4.83	0.478	11
Ability to overcome conflicts and crisis	71	4.8	0.435	12
Leadership in the territory/sector	71	4.79	0.505	13
Autonomy in decision making.	71	4.79	0.532	14
Sensibility and capacity to appreciate values.	71	4.7	0.641	15

\*The ranking is based on the mean score\*

Source: Data from key informant interviews.

Ethical-social strategies influenced agriculture production in the Agatobwe marshland. Skills and competencies were highly ranked while the sensibility and capacity to appreciate values were the least ranked. Farmers believe in the skills and competencies as driving forces to turn inputs into outputs. Also, skills and competencies are what farmers exchange during social learning which is correlated to the value they attributed to the importance of technical knowledge and skills (good agriculture practices, post-harvest handling and storage, governance, and financial management), and knowledge on cooperation, networking, and social skills. They believe good local governance supported cooperative formation and growth. Farmers through the "equitable opportunities for all strategy" confirmed they equally received support from both the project and local government which positively influenced agriculture production. This contradicts findings in the study conducted by Choudhury & Haque (2016) whereby marginal people are deprived of public goods by the local power elites. Conclusively, local people's attitudes, behaviors, and interactions constituting the ethical-social component contributed to agriculture production.

### 3.4.3. Political-contextual strategies

The table below summarizes data about the level of agreement farmers attribute to political-contextual strategies affecting agriculture production.

Table 6: Political-contextual strategies

Strategies	N	Mean	Standard Deviation	Ranking
Competitiveness at the national level	71	5	0	1
Agriculture knowledge and information	71	4.97	0.167	2

Solidarity in society with agriculture/rural areas	71	4.96	0.203	3
Cooperative legal frameworks and regulation	71	4.96	0.264	4
Rwanda agriculture policy	71	4.94	0.232	5
Technological change (new technologies like irrigation during the dry season)	71	4.93	0.258	6
National subsidies	71	4.93	0.258	7
Domestic market	71	4.92	0.28	8
Biodiversity, environment	71	4.9	0.384	9

Source: Data from key informant interviews

Political-contextual strategies influenced agriculture production in the Agatobwe marshland. Competitiveness at the national level was ranked first while biodiversity and environment were ranked last. Competitiveness was highly ranked due to linkage sessions between farmers and buyers which were organized by the SMART project to trigger market-oriented farming to increase income at the household level. Competitiveness strengthens market-oriented agriculture (Kahan, 2023). Social capital enhances farmers' interactions and sharing of knowledge and information (Ren, Fu, & Zhong, 2022; Kos, Lensink, & Meuwissen, 2023). The formation of cooperatives allowed smallholder farmers to receive capacity building from various actors. Capacity strengthening is pivotal to strengthening the skills and competencies of farmers to adapt to the changing farming environment (Kahan, 2023). Capacity building increased agricultural knowledge and information which in turn increased crop yield to attract buyers. Conclusively, the project was able to fit into the national and local political and development priorities constituting the political-contextual component that underpinned its success.

#### 3.4. 4. Social learning

Experience of change in realities underpins social learning. Project stakeholders participate in the project activities with their attitudes, behaviours, and values that generate actions integrating experimental and expert knowledge to foster mutual learning (Nicolás, 2016).

##### 3.4.1 Importance of knowledge and skills according to farmers' experience

Farmers prioritize different sets of knowledge needed in agriculture production. From their experience, farmers confirmed social learning positively contributed to agriculture production. Overall, they give high importance to technical knowledge and skills (good agriculture practices, post-harvest handling and storage, governance, and financial management), marketing knowledge and skills, management knowledge and skills, farm strategic planning knowledge and skills, and cooperation, networking, social skills. Farmers stressed the high importance of cooperation, networking, and social skills because they believed in the importance of working with each other to learn from other each. Social capital creates relationships that generate social learning (Nicolás, 2016). The low importance of marketing knowledge and skills (85%) is attributed to the fact the farmer cooperatives have not yet reached a mature stage to achieve a production surplus which would trigger the need for high marketing knowledge and skills to attract big buyers.

##### 3.4.2. Knowledge sources and the role of knowledge infrastructure, organizations, and institutions

Knowledge infrastructure, organizations, and institutions created and disseminated knowledge. Farmers confirmed learning from and among themselves while also learning from Agricultural Knowledge and Information Systems (AKIS), market actors, civil society, and administrative bodies. Learning from themselves, fellow farmers, and cooperatives was highly ranked because

farmers' cooperatives receive agriculture production capacity strengthening from various actors. Farmer promoters and farmer field schools are highly ranked due to the decentralization of agriculture extension services (Neza, Higiroy, Mwangi, & Ochatum, 2021). Rwanda Agriculture Board is lowly ranked because it does not often directly interact with farmers but rather trains farmer promoters who offer extension services at the decentralized level (RAB, 2022). Radio stations disseminate information about agriculture season preparations. TUBURA (input supplier) provides advisory and extension services (MINAGRI, 2019). Civil society actors like Good Neighbors International, World Food Programme, and Rwanda Rural Rehabilitation Initiative trained farmer cooperatives on good agriculture practices, post-harvest handling, and storage, and facilitated market linkage sessions between farmer cooperatives and buyers. Local government administrative bodies at the cell, sector, and district levels are highly ranked because there are staff under the agriculture and natural resources unit to disseminate agriculture-related policies and support farmer cooperatives (MINAGRI, 2019; RAB, 2022). Hence, experiential, and expert knowledge were integrated to foster social learning.

#### **4. Conclusion and recommendations**

Land reclamation activities in the Agatobwe marshland increased food security and nutrition. The increased agricultural productivity increased food availability. Market linkage sessions brought together stallholder farmers' cooperatives with buyers which increased food access and farmers' income. Market linkage sessions also increased farmers' knowledge and information to access markets which are key to creating sustainable markets. Marshland reclamation activities complied with the principles for responsible investment in agriculture and food systems. This underpins the sustainability of agriculture production. Agatobwe marshland reclamation as a created community asset built the resilience of the place-based community, interaction-based community, and community of practice and interest. The civil society gained the highest influence on agriculture production due to infrastructural development, capacity strengthening and capital flow while the influence of public administration and political fields are due to political ideology. The integration of key agriculture production elements constituting a technical–entrepreneurial component coupled with local people's attitudes, behaviors, and interactions constituting the ethical–social component contributed to agriculture production. Furthermore, the “Sustainable Market Alliance and Assets Creation for Resilient Communities and Gender Transformation (SMART) Project” was able to fit into the national and local political and development priorities constituting the political–contextual component that underpinned its success. With beneficiaries' participation, the technical-entrepreneurial, ethical-social, and political-contextual strategies interplayed to enhance social learning beyond materialized crop yield. It is recommended that the private sector system be strengthened to play its role in agriculture development adequately. The emphasis should be on quality seed production. With recurring impacts of climate change affecting the agriculture sector, livelihood diversification and crop insurance are highly recommended to safeguard community resilience.

## References

- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 387-404.
- Agidew, A.-m. A., & Singh, K. N. (2018). Determinants of food insecurity in the rural farm households in South Wollo Zone of Ethiopia: the case of the Teleyayen sub-watershed. *Agricultural and Food Economics*, 1-23.
- Ahvo, A., Heino, M., Sandström, V., Chrisendo, D., Jalava, M., & Kummu, M. (2023). Agricultural input shocks affect crop yields more in the high-yielding areas of the world. *Nature Food*, 1037–1046.
- Aliaga, R. J., Ríos-Carmenado, I. D., Howard, F. S., Espinoza, S. C., & Cristóbal, A. H. (2022). Integration of the Principles of Responsible Investment in Agriculture and Food Systems CFS-RAI from the Local Action Groups: Towards a Model of Sustainable Rural Development in Jauja, Peru. *Sustainability*, 1-26.
- Apanovich, N., & Mazur, R. E. (2018). Determinants of seasonal food security among smallholder farmers in south-central Uganda. *Agriculture & Food Security*, 1-10.
- Barrios, R. E. (2014). Here, I'm not at ease': anthropological perspectives on community resilience. *Disasters*, 329-350.
- Beauchamp, E., Hirons, M., Brown, K., & Milner-Gulland, E. (2020). Twenty priorities for future social-ecological research on climate resilience. *Environmental Research Letters*, 1-12.
- Boynton, P. M., & Greenhalgh, T. (2004). Selecting, designing, and developing your questionnaire. *BMJ*, 1312-1315.
- Broom, D. (2021, April 1). *Mobile creches are transforming the lives of women and children in Africa*. Retrieved from <https://www.weforum.org/agenda/2021/04/mobile-childcare-lets-women-work-burkina-faso/>
- Cazorla, A., De los Ríos, I., & Salvo, M. (2013). Working With People (WWP) in Rural Development Projects: a Proposal from Social Learning. *Cuadernos de Desarrollo Rural*, 131-157.
- Choudhury, M. U., & Haque, C. E. (2016). International Journal of Disaster Risk Reduction. *We are more scared of the power elites than the floods : adaptive capacity and resilience of wetland community to flash flood disasters in Bangladesh*, 145-158.
- Dehrashid, A. A., Bijani, M., Valizadeh, N., Dehrashid, H. A., Nasrollahizadeh, B., & Mohammadi, A. (2021). Food security assessment in rural areas: evidence from Iran. *Agriculture & Food Security*, 2-18.
- Dixon, J., Gulliver, A., Gibbon, D., & Hall, M. (2001). *Farming systems and poverty : improving farmers' livelihoods in a changing world* . Rome and Washington DC: FAO and World Bank.

- European Environment Information and Observation Network. (2021, December 21). *Political ideology*. Retrieved from <https://www.eionet.europa.eu/gemet/en/concept/13335>
- FAO. (2008). *An Introduction to the Basic Concepts of Food Security*. Retrieved from <https://www.fao.org/3/al936e/al936e00.pdf>
- FAO. (2014). *Policy Support and Governance Gateway*. Retrieved from Principles for Responsible Investment in Agriculture and Food Systems (RAI): <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/422954/>
- FAO, IFAD, UNICEF, WFP and WHO. (2023). *The State of Food Security and Nutrition in the World 2023*. . Rome: FAO.
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society*, 1-10.
- Gibson, M. (2012). Food Security—A Commentary: What Is It and Why Is It So Complicated? *Foods*, 18–27.
- Hargreaves, J., & Seale, C. (2006). The Use of a Semi-Structured Questionnaire to Reveal Participants' Perceptions of an In-Service Masters Course in Biological Education. *Journal of In-Service Education*, 118-124.
- Kahan, D. (2023, May 17). *Market-Oriented Farming: an Overview*. Retrieved from <https://openknowledge.fao.org/server/api/core/bitstreams/5a3ffb19-879a-4cc2-b0e5-521fbfd51615/content>
- Kos, D., Lensink, R., & Meuwissen, M. (2023). The role of social capital in adoption of risky versus less risky subsidized input supplies: An empirical study of cocoa farmers in Ghana. *Journal of Rural Studies*, 140-152.
- Lakshmanan, T. (1982). A systems model of rural development. *World Development* , 885-898.
- LODA. (2024, March 8). *Vision Umurenge Program (VUP)*. Retrieved from [https://www.loda.gov.rw/vup#:~:text=The%20Vision%202020%20Umurenge%20Programme,Agency%20\(LODA\)%20in%202013.](https://www.loda.gov.rw/vup#:~:text=The%20Vision%202020%20Umurenge%20Programme,Agency%20(LODA)%20in%202013.)
- Magesa, M. M., Michael, K., & Ko, J. (2020). Access and use of agricultural market information bysmallholder farmers: Measuring informational capabilities. *Electronic Journal of Information Systems in Developing Countries*, 1-21.
- Magingxa, L. L., Alemu, Z. G., & Schalkwyk, H. D. (2009). Factors influencing access to produce markets for smallholder irrigators in South Africa. *Development Southern Africa*, 47-58.
- Maisonave, H., & Mamboundou, P. N. (2020). Agricultural economic reforms, gender inequalities and poverty in Senegal. *HAL Id: hal-03015249*, 1-11.
- Martin, J. L. (2015). WHAT IS IDEOLOGY? *SOCIOLOGIA, PROBLEMAS E PRÁTICAS*, 9-31.
- Matt, M. (2023). The Role of Markets and Value Chains in Shaping Sustainable Agrifood Systems. *Journal of Innovation Economics & Management*, 1-19.



- MINAGRI. (2019, December 10). *Agriculture Stakeholders Devise Ways to Strengthen Agriculture Extension Services*. Retrieved from <https://www.minagri.gov.rw/updates/news-details/agriculture-stakeholders-devise-ways-to-strengthen-agriculture-extension-services>
- Mogues, T., Yu, B., Fan, S., & McBride, L. (2012, October). *The impacts of public investment in and for agriculture: Synthesis of the existing evidence*. Retrieved from ESA Working paper No. 12-07: <https://www.fao.org/3/ap108e/ap108e.pdf>
- Neza, B. N., Higiroy, J., Mwangi, L. W., & Ochatum, N. (2021). *Institutionalizing farmer field schools: Twigire Muhinzi National Extension System in Rwanda*. FAO Investment Centre Country Highlights 8. Rome, Italy: Food and Agriculture Organization (FAO); and International Food Policy Research Institute (IFPRI).
- Nicolás, V. L. (2016). Towards a transformational hydraulic engineering project for the territory: A focus on the Working With People (WWP) model. *Land Use Policy*, 246-252.
- NISR. (2021, September 04). *Rwanda - Comprehensive Food Security and Vulnerability Analysis 2021*. Retrieved from <https://microdata.statistics.gov.rw/index.php/catalog/106>
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *Community psychology*, 127-150.
- Nugroho, A. D. (2021). Agricultural market information in developing countries: A literature review. *Agric. Econ*, 468–477.
- Nurzaman, A., Shaw, R., & Roychansyah, M. S. (2020). Measuring community resilience against coastal hazards: case study in baron beach, Gunungkidul regency. *Progress in Disaster Science*, 1-24.
- OECD. (2013, March). *Policy Framework for Investment in Agriculture*. Retrieved from [https://www.oecd.org/daf/inv/investment-policy/PFIA\\_April2013.pdf](https://www.oecd.org/daf/inv/investment-policy/PFIA_April2013.pdf)
- Omar, S., Ghani, R. A., Khalid, N., Jolánkai, M., Tarnawa, Á., Percze, A., . . . Kende, Z. (2023). Effects of Seed Quality and Hybrid Type on Maize Germination and Yield in Hungary. *Agriculture*, 2-17.
- RAB. (2022). *RAB through TWIGIRE MUHINZI Trains 14000 Farmer Promoters on Agricultural Practices*. Retrieved from <https://www.rab.gov.rw/1-1/news-details/rab-through-twigire-muhinzi-trains-14000-farmer-promoters-on-agricultural-practices>
- Räsänen, A., Lein, H., Bird, D., & Bird, D. (2020). Conceptualizing community in disaster risk management. *The International Journal of Disaster Risk Reduction*, 1-8.
- Ren, Z., Fu, Z., & Zhong, K. (2022). The influence of social capital on farmers' green control technology adoption behavior. *Sec. Environmental Psychology*, 1-14.
- Ríos, I. d., Rivera, M., & García, C. (2016). Redefining rural prosperity through social learning in the cooperativesector: 25 years of experience from organic agriculture in Spain. *Land Use Policy*, 85–94.

- Rwabukambiza, V. (2022). *Household livelihoods and food security in jeopardy. Farmers' perspectives on impacts of land scarcity on household livelihoods and food security in rural Rwanda*. Retrieved from <https://stud.epsilon.slu.se/17683/3/rwabukambiza-v-20220420.pdf>
- Sebatta, C., Mugisha, J., Katungi, E., Kashaaru, A., & Kyomugisha, H. (2014). Smallholder Farmers' Decision and Level of Participation in the Potato Market in Uganda. *Modern Economy*, 895-906.
- The World Bank. (2024, March 4). *Food Security Update : World Bank Response to Rising Food Insecurity*. Retrieved from <https://www.worldbank.org/en/topic/agriculture/brief/food-security-update>
- The World Bank Group. (2015, April). *RWANDA Poverty Assessment: Poverty Global Practice, Africa Region*. Retrieved from <https://documents1.worldbank.org/curated/en/255161467998828941/pdf/Rwanda-Poverty-assessment-poverty-global-practice-Africa-region.pdf>
- Thornton, P., Loboguerrero, A., Campbell, B., Kavikumar, K., & Shackleton, L. M. (2019). *Rural livelihoods, food security and rural transformation under climate change*. Retrieved from [https://gca.org/wp-content/uploads/2020/12/RuralLivelihoodsFoodSecurityRuralTransformation\\_V2.pdf](https://gca.org/wp-content/uploads/2020/12/RuralLivelihoodsFoodSecurityRuralTransformation_V2.pdf)
- Uddin, M. S., Uddin, M. S., Walker, D., & Choudhury, M.-U.-I. (2020). Community resilience to cyclone and storm surge disasters: evidence from coastal communities of Bangladesh. *Journal of Environmental Management*, 1-13.
- Ume, C. (2023). The role of improved market access for small-scale organic farming transition: Implications for food security. *Journal of Cleaner Production*.
- UNISDR. (2013). Proceeding. Fourth Session of the Global Platform for Disaster Risk Reduction. *Palgrave Macmillan* (pp. 21-23). Geneva: United Nations Office for Disaster Risk Reduction (UNISDR).
- Vagias, W. M. (2006). *Likert-Type Scale Response Anchors*. Retrieved from <https://media.clemson.edu/cbshs/prtm/research/resources-for-research-page-2/Vagias-Likert-Type-Scale-Response-Anchors.pdf>
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and Transformability in Social–ecological Systems. *Ecology and Society*, 1-9.
- Walle, D. v. (1998, August ). *Targeting Revisited*. Retrieved from <https://documents1.worldbank.org/curated/en/250031468149103548/pdf/766220JRN0WBRO00Box374385B00PUBLIC0.pdf>
- WFP. (2016, September). *Asset Creation*. Retrieved from [https://cdn.wfp.org/wfp.org/publications/ASSETS%20WFP%20UPDATE%20-%20FACTSHEET\\_UPDATED.pdf](https://cdn.wfp.org/wfp.org/publications/ASSETS%20WFP%20UPDATE%20-%20FACTSHEET_UPDATED.pdf)
- WFP. (2020, December 17). *Republic of Korea contributes USD 8 million to WFP to enhance community resilience and food security in Rwanda*. Retrieved from

<https://www.wfp.org/news/republic-korea-contributes-usd-8-million-wfp-enhance-community-resilience-and-food-security>

- WFP. (2021, November 23). *How WFP maximizes value for money and ensures transparency and accountability*. Retrieved from <https://www.wfp.org/stories/how-wfp-maximizes-value-money-and-ensures-transparency-and-accountability>
- Xu, W., Xiang, L., & Proverbs, D. (2020). Assessing Community Resilience to Urban Flooding in Multiple Types of the Transient Population in China. *Assessing Community Resilience to Urban Flooding in Multiple Types of the Transient Population in China*, 1-22.
- Yoon, D., Kang, J. E., & Brody, S. D. (2015). A measurement of community disaster resilience in Korea. *Journal of Environmental Planning and Management* , 436-460.
- Zaman, M. O., & Raihan, M. M. (2023). Community resilience to natural disasters: A systemic review of contemporary methods and theories. *Natural Hazards Research*, 583-594.
- Zhan, J., & Speller, H. M. (2015). *The Impact of Larger Scale Agricultural Investments on Communities in South East Asia: A First Assessment*. Geneva: International Development Policy series No.6.
- Zhao, Y., & Chen, Y. (2023). Global Patterns of Agricultural Investment and Food Security: Evidence from the fDi Markets Database. *Foods*, 1-14.
- Zhong, M., Lin, K., Tang, G., Zhang, Q., Hong, Y., & Chen, X. (2020). A Framework to Evaluate Community Resilience to Urban Floods: A Case Study in Three Communities. *Sustainability*, 1-21.

**Communication aligned with the Sustainable Development Goals**

