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Climate-Smart Agriculture Rapid Appraisal (CSA-RA) Report for Guyana



UNIVERSITY of GUYANA



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Climate-Smart Agriculture Rapid Appraisal (CSA-RA) Report for Guyana

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This Climate-Smart Agriculture Rapid Appraisal Report has been prepared as an output for the Guyana – Development of an Evidence-Based, Gender Equitable Framework for studying Climate-Smart Agriculture Interventions, and has not been peer reviewed. This study was led by the International Center for Tropical Agriculture (CIAT) (now part of the Alliance of Bioversity International and CIAT) under the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). The project is financed by the Caribbean Development Bank (CDB) and implemented under the Ministry of Agriculture GOGY. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS, CIAT, donor agencies, or partners. The authors are responsible for any errors or gaps in the report.

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Acronyms and abbreviations

AEZ	Agro-Ecological Zones
CARDI	Caribbean Agricultural Research and Development Institute
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CI	Conservation International
CIAT	International Center for Tropical Agriculture
CIDA	Canadian International Development Agency
CSA	Climate-Smart Agriculture
CSA-RA	Climate-Smart Agriculture Rapid Appraisal
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GLDA	Guyana Livestock Development Authority
GMC	Guyana Marketing Corporation
GRDB	Guyana Rice Development Board
GYD	Guyana dollars
HESAD	Hinterland Environmentally Sustainable Agricultural Development
IFAD	International Fund for Agricultural Development
IICA	Inter-American Institute for Cooperation on Agriculture
ILO	International Labour Organisation
IMF	International Monetary Fund
IPED	Institute of Private Enterprise Development
KMRCG	Kanuku Mountain Community Representative
MoA	Ministry of Agriculture
MOIPA	Ministry of Indigenous Peoples Affairs
NAREI	National Agricultural Research and Extension Institute
NDI	National Democratic Institute
NDIA	National Drainage and Irrigation Authority
NRDDB	North Rupununi District Development Board
PICSA	Participatory Integrated Climate Services for Agriculture
PROPEL	Promotion of Regional Opportunities for Produce through Enterprises and Linkages
PTCCB	Pesticides and Toxic Chemicals Control Board
RCCI	Rupununi Chamber of Commerce and Industry
RDC	Regional Democratic Council
SRI	System of Rice Intensification
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WADN	Women Agro Processors Development Network
WWF	World Wildlife Fund

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Executive summary

This Climate-Smart Agriculture Rapid Appraisal (CSA-RA) exercise in Guyana is part of the Guyana – Development of an Evidence-Based, Gender Equitable Framework for Studying Climate-Smart Agriculture Interventions. Information gathered in the CSA-RA will build on the “Vulnerability and Capacity Assessment: Impacts of Climate Change on Guyana’s Agricultural Sector” and the “National Adaptation Strategy to Address Climate Change.” This report is a detailed and comprehensive summary of the information obtained during the CSA-RA, structured by activity. The CSA-RA used key-informant interviews, participatory workshops, transect walks, and farmer interviews, as well as gender-disaggregated methods to gather information on important agriculture-related features and constraints faced by farmers.

The CSA-RA was carried out in four zones across two regions (3 and 9). Selection criteria included encompassing the high variability in climate and topography, land agro-ecologies, cultural and socioeconomic status within the regions. Four workshops were conducted, one in Region 3 and three in Region 9 (Annai, Nappi, and Sand Creek). Agriculture plays an important role as the primary source of livelihood in the two regions. Subsistence small-scale mixed crop-livestock systems dominate the farming systems. Flooding, drought, pests and diseases are the main hazards that affect the agricultural value chains.

Youth and women’s engagement in agriculture is low in non-traditional indigenous farms primarily due to the undeveloped potential felt along the entire value chain, from input acquisition to on-farm production, postharvest management, and marketing. Youth in particular are migrating to urban centers for employment. Labor is a key factor that women consider when deciding in which value chains to engage. Ease of management and freeing time to participate in household chores are key reasons why women selected horticultural value chains as the most important. Other factors important to communities when choosing value chains and agricultural practices are food security, nutrition, income, knowledge, capital required, and yield.

Farmers in the regions employ several adaptive approaches such as crop rotation, use of farmyard manure, farm drainage, shading, seed selection, use of certified seed, and inorganic fertilizers. However, the adoption of climate-smart agricultural practices remains low primarily due to the lack of financial and insurance services, limited knowledge on the practices, poor access to climate information services, the lack of markets, and the lack of proper agricultural equipment. The provision of timely and accurate climate information in combination

with proper drainage; early-maturing, high-yielding, and tolerant varieties; extension services; value addition; and irrigation present an important opportunity to enhance resilience for the agriculture value chains.





It was noted that institutional presence is limited, especially in isolated indigenous communities, particularly for the provision of training on climate-smart practices along the entire value chain, addressing gender-specific challenges related to agricultural production, and the provision of financial support. The lack of resources and infrastructure, especially irrigation, drainage, road network, markets, mechanization, and postharvest processing, inhibits agricultural production, expansion, and intensification. Addressing these constraints provides an opportunity for developing agriculture away from the coastal plains and thereby contributing to Guyana’s climate resilience. In addition, irrigation especially focusing on horticultural crops has great potential and offers an opportunity for both agricultural diversification and expansion as well as climate adaptation.

Although comparing results across the sites has limitations, primarily because the analysis is based on participatory interviews, the institutional mapping reveals a limited presence of both government and non-government organizations (NGOs) in the communities. While environmental NGOs in Region 9 have promoted the engagement of indigenous communities in environmentally sustainable agriculture for more than two decades through Village Resources Development Plans organised and supported by Conservation International and World Wildlife Fund (WWF) in Rupununi, it was observed that the institutional networks are mainly centralized. Centralization indicates that control over network flows is concentrated in few actors, implying that there are core actors, decision makers, and gatekeepers of information. This can limit the effectiveness of any climate-smart agriculture outreach strategy. The private sector and NGOs are providing helpful services to support agriculture. A few funding agencies, such as IFAD, have also been engaged in participatory dynamics and sustainable agricultural projects with local communities of Region 9. It is noteworthy that gaps existed in the presence of national institutions dedicated to finance. In making use of these networks to inform outreach efforts to the communities, it will be essential to take into account both the network structure and the characteristics of the various actors. The institutions identified are ideal targets for partnerships or dissemination of suitable technologies.



1. Introduction

1.1. Objectives of the CSA-RA in Guyana

- 1  Identify and prioritize locally appropriate, gender equitable CSA options to improve resilience to climate risk.
- 2  Evaluate gender roles and responsibilities, including the gender division of labor and vulnerabilities.
- 3  Identify farmers' perceptions of weather patterns and their perceived impact on agricultural production.
- 4  Identify opportunities for mainstreaming climate-smart agriculture and potential social, economic, and/or institutional barriers to adoption.

1.2. Site selection

To represent the main geographical zones and capture the socioeconomic, climatic, and topographic variability, which is expected to be reflected in the farming systems, the CSA-RA focused on Region 3 (Essequibo Islands-West Demerara) and Region 9 (Upper Takutu-Upper Essequibo), which occupy the coastal lands and hinterlands, respectively (Figure 1). Region 3 is dominated by Creole communities and Region 9 is dominated by Amerindian communities. Region 9 is the largest in Guyana and, therefore, we selected three survey locations traversing the North (Annai), Central (Nappi) and South (Sand Creek) Rupununi to represent the social and agro-ecological contrast as well as the participation of two major Amerindian Groups, Makushi at the North and Central Rupununi and Wapishana at the South. At each workshop location, farmer representatives from the neighbouring villages were also invited.

Considering the agro-ecological characteristics of the regions, it is found that Region 3 Coastal landscapes goes from the islands located at the estuaries of the Essequibo River to the riparian communities upstream of the rivers. An extensive coastal aquifer sustains freshwater available for swamp and marsh coastal wetlands with low influence of salinization. Soils in the northern part of the region are within the ecological areas dominated by mangroves and marsh daily tides with potential for high salinity that during high tides flood extensive areas influencing crop productivity in the area.

Region 9 hinterlands is located in mosaics of different types of savannahs from seasonally flooded in the lower areas to park-land or with scattered trees in the non-flooded *Trachypogon* savannahs in topographically higher lands (following similar associations in nearby Roraima Brazilian savannas [1]). The three subregions North Rupununi, Central Rupununi and South Rupununi can have from Ultisol-Oxisol in the well-drained parkland *Trachypogon* savannas, to Gleysol – hydromorphic characteristics in the seasonally flooded savanna wetlands. These wetlands were identified by Araújo et al. (2017) [1] as having soils with higher hydro-edaphic restrictions for crop species, including low pH, high aluminium toxicity, than the well drain parkland savannas.

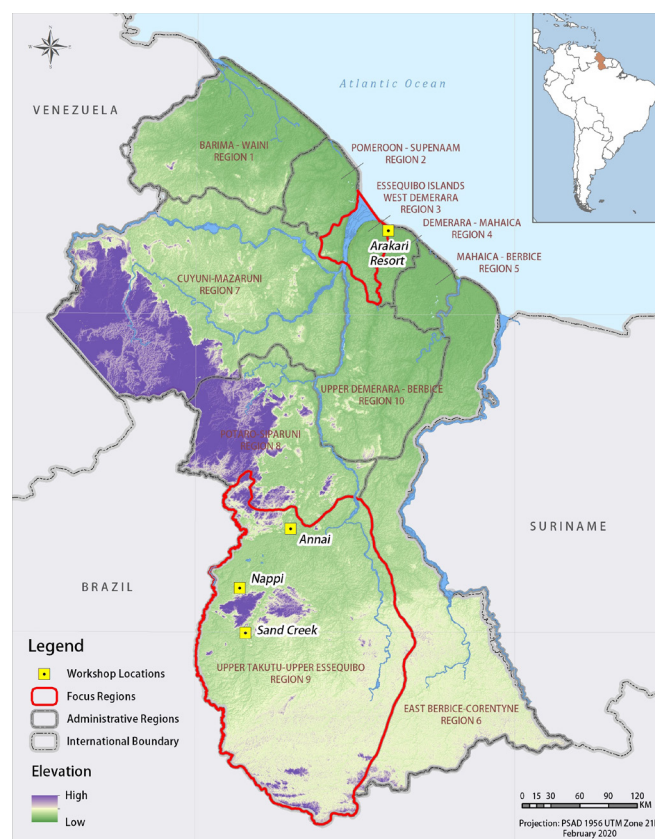


Figure 1 Map showing location of the CSA-RA with the surveyed sites in Guyana.

1.3. Agricultural context and livelihoods

Guyana is divided into ten administrative regions: Barima-Waini, Pomeroon-Supenaam, Essequibo Islands-West Demerara, Demerara-Mahaica, Mahaica-Berbice, East Berbice-Corentyne, Cuyuni-Mazaruni, Potaro-Siparuni, Upper Takutu-Upper Essequibo, and Upper Demerara-Berbice. Its fertile coastline supports agriculture and fisheries. The International Monetary Fund (IMF, 2019) [2] projects the country's economic growth at 4.8% in 2019. The Guyanese economy relies on exports, which represent nearly 60% of its gross domestic product (GDP) (namely, sugar, gold, bauxite, shrimp, timber, and rice).



THE TOTAL POPULATION IS **779,004** WITH AN ANNUAL GROWTH RATE OF **0.49%** [3].



SCHOOL ENROLMENT IN PRIMARY EDUCATION IS **98%**, WITH LITERACY RATE AT 15-24 YEARS BEING **96.33%** FOR MALES AND **97.04%** FOR FEMALES [5].



MALES ARE **393,637** AND FEMALES ARE **385,367**



IN TERMS OF GENDER, FEMALES CONTRIBUTE **22%** OF FAMILY WORK VIS-À-VIS **10%** FOR MALES ACCORDING TO 2018 ILO ESTIMATES [6].

MOST PEOPLE STAY IN RURAL AREAS, WITH THE URBAN POPULATION REPRESENTING



26.61% OF THE TOTAL POPULATION.

THE COUNTRY HAS A YOUNG POPULATION, WITH PEOPLE AGED **0-14 YEARS** MAKING UP **28%** OF THE TOTAL POPULATION [3].



THOSE BETWEEN **25 AND 54 YEARS** MAKE UP **38.52%**

THE TOTAL FERTILITY RATE IS **1.97%** - CHILDREN BORN PER WOMAN ACCORDING TO 2018 ESTIMATES [4].



THIS IS COUPLED WITH A HIGH DEPENDENCY RATIO AND UNEMPLOYMENT OF **12%** OF THE TOTAL LABOR FORCE.

GUYANA RANKS **55TH** OUT OF 117 QUALIFYING COUNTRIES IN THE GLOBAL HUNGER INDEX WITH A SCORE OF **12.6**,



MEANING THAT IT SUFFERS A MODERATE LEVEL OF HUNGER. THE PROPORTION OF THE UNDERNOURISHED POPULATION IS BELOW **10%** [7].

Arable land is estimated at 420,000 hectares, with each person holding 0.54 ha. Value-added agriculture, forestry, and fishing together contribute 15.44% to the GDP. Employment in agriculture is at 18.25% [3]. It is estimated that approximately 90% of the population lives near the coast, and the agricultural sector is concentrated in these areas providing livelihood for 25,000 households [8]. The major crops are rice, sugar, coffee, cocoa, coconuts, edible oils, copra, fruits, vegetables, and tobacco.

EXPORT EARNINGS ARE FROM



Livestock include cattle, sheep, pigs, goats, and chickens. Rice occupies 91,054 ha and, in the June 2019 season, yields were estimated at a record high of 6.07 t/ha. The livestock sector is also thriving as savannah grassland supports feeding. It is estimated that Guyana has 220,000–250,000 heads of beef and dairy cattle [10]. According to FAOSTAT (2019) [11], by 2017, Guyana had 27,380,000 chickens, 82,606 goats, 12,600 pigs, and 131,673 sheep. The livestock subsector in 2017 contributed approximately 13.6% of the agricultural GDP and 2.5% of total GDP.

2. Methodology

A multi-disciplinary team, which included team members from CIAT in collaboration with Guyana University, conducted the CSA-RA in August 2019. Participatory tools and techniques were used in collecting primary data. Secondary information was also collected to inform the fieldwork and inform the data collection sites. The following subsections include a short description of the tools employed in the CSA-RA. The CSA-RA tool is available for download and is freely available on the Harvard Dataverse web portal under the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) website.

2.1. Farmer workshops

A workshop was held with 25 to 30 local stakeholders who included farmers, farmer representatives, extension agents, and local administrative leaders in each surveyed zone. These workshops were organized with the assistance of the agriculture office at the regional and local level and aimed to have good representation of men, women, and youth (in this case, below 30 years of age). Several activities undertaken during the farmer workshops are discussed below.

2.1.1. Guided discussion

Guided discussion was used as an ice-breaking exercise and to: (1) identify the different crops and livestock in the region; (2) understand some of the agricultural gender norms; (3) understand the primary uses of the crops by the local farmers (e.g., home consumption vs. cash crop); and (4) identify the most important crops and common crop varieties.

2.1.2. Value chain characterization

We used a value chain approach to identify the major agricultural activities along four stages: input supply; on-farm production; harvesting, storage, and processing; and product marketing. The methodology also identified the type and scale (small, medium, or large) of the actors involved in the activities and gendered division of labour.

2.1.3. Generate a short list of practices related to AEZ and gender

Prioritization of CSA technologies began by presenting the long list of practices generated in a previous workshop held in Guyana with agricultural experts for each of the regions and the prioritized crops. To generate a short list of practices, farmers were divided into smaller groups based on gender and asked to select two to three crops they considered important. Farmers were then asked to identify specific practices that were relevant for their respective region and crops, and to include practices missing from the pre-prepared list.

2.1.4. Prioritization of the indicators for adopting practices

Grouped by gender, the farmers were asked to identify the indicators that they used to prioritize the agricultural practices in the short list. Follow-up questions identified constraints and support needed to implement the identified technologies or practices.

2.1.5. Institutional/organization mapping using Venn diagrams

Venn diagrams were used to document the local institutions and groups that support agriculture in each zone. After naming all the institutions, participants



Photo: CIAT/Caroline Mwangera

Figure 2 Institutional mapping exercise in Annai, North Rupununi, Region 9.

ranked each in terms of its relative importance (using small, medium, and large circles). The circles were placed relative to each other to symbolize linkages between different institutions as follows: separate circle = no contact; touching circles = information passes between institutions; small overlap = some co-operation in decision- making, planning, and/or implementation; and large overlap = significant co-operation in decision-making, planning, and/or implementation (Figure 2).

2.1.6. Transect walks/village visits

A transect walk through the village and individual farmers' fields was conducted to identify food and cash crops, farming systems, soil and vegetation patterns, socioeconomic indicators, livestock types, and land management practices. Specifically, the transect walk was used to familiarize the team with the biodiversity and resource endowments with the aim of gaining a visual understanding of the challenges and opportunities for agriculture in each area. Photos were taken of key landmarks and GPS coordinates noted.

3. Results and discussion

3.1. Participation in the CSA-RA

Eighty-five (85) participants attended the workshops (Table 1) and an additional 28 were interviewed during the village/farm visits. The overall percentage of males and females interviewed was 52% and 48%, respectively. Participants in the workshops and village visits included district- and local-level officials who comprised administrative, agricultural, livestock, and extension officers. A lower percentage of women participated in the interviews in Region 3 (creole dominated) compared to Region 9 (indigenous dominated). For Region 3, this was attributed to the low involvement of women in decision-making processes and control of agricultural production activities at the household level among the coastal communities.



Region	Workshop location	Number of participants	Percentage of women
3	West Demerara	26	38%
9	Annai	21	52%
9	Nappi	20	60%
9	Sand Creek	18	44%

Table 1. Regions and respondents interviewed for the CSA-RA.

The workshop in Annai targeted several Makushi Amerindian communities around North Rupununi, including Annai, Surama, Aranaputa, Toka, Semona, and Wowetta. The workshop in Nappi facilitated Makushi

Amerindian representatives from the satellite villages such as Parashara, including neighboring Moco Moco village and Moco Moco settlement. The workshop in Sand Creek facilitated Wapishana Amerindian representatives from the satellite villages such as Potaronao and Shea.

3.2. Farming systems and challenges

Regions 3 and 9 have a range of social and agro-ecological dynamics as well as diverse soil types and vegetation. The CSA-RA established that rainfed agriculture is the most common practice on small-scale farms for subsistence crops. There are two main crop-growing seasons (May to August and November to January). Table 2 summarizes the principal farming systems at the study sites.

Location	Main farming system	Characteristics	Challenges
Region 3	Small-scale mixed subsistence with rice/ horticulture	<ul style="list-style-type: none"> - Most farms are situated in the back lands of the Esequibo islands, such as Leguan, to avoid the effects of salt water during overtopping of the sea defence. Extensive rice crops also dominate from Parika to the West Bank Demerara. - Mixed livestock and cropping systems. - Important crops are ground provision, root tubers such as cassava. - Other crops are pineapple, plantain and citrus, coconut, mango, breadfruit, cherries, and lemon. - Livestock include pigs, goats, cattle, sheep, ducks, and chickens. - A small percentage of farmers use a sea defense (dam) to farm. These are small plots, approximately 0.25 acres. - Cash crops integrated in the farming systems are plantain, eggplant, pumpkin, okra, squash, cucumber, and hot pepper. - Aquaculture: catfish. - Horticultural plots around the households and rice fields are farther from the homesteads. - High importance of ground provisions, such as sweet potato, cassava, and eddo. - The main modes of transportation to farms are tractors, trucks, bicycles, and walking. - Organic pest management is practiced. - In Santa Aratak, the only indigenous settlement in Region 3, logging, mining, craft, hunting and fishing are also important economic activities. Animals hunted include Armadillo, deer, Tapir, Laba, and wild pigs. - Farmers select crops based on the weather patterns and soil type on the farm. 	<ul style="list-style-type: none"> - Since most residents on the island are farmers, they have to seek external markets. - In general, there is poor infrastructure (roads). This affects access to the area and ease of taking produce to markets. - Vendors travel by boat to the island to purchase crops from farmers; however, if there is an excess supply in the market, vendors do not buy, resulting in food waste. - Youth migration for employment. - Due to high unemployment on the island, persons do not have sufficient spending power. - Livestock often die because of flooding, infections, and poor access to veterinary services. - Pest infestation has become problematic in the last 3 years, especially acoushi ants, red ants, and harlequin (swamp ants). - Acidic soils. - In spring high tides, farmers are exposed to general flooding and saline water intrusions.
Region 9	Small-scale mixed subsistence with cassava/ horticulture	<ul style="list-style-type: none"> - Most important value chains are cassava, horticulture (cash crops), peanut, chickens, plantain, banana. - Other value chains are corn (maize), citrus, ducks, cattle, sheep, potatoes, pumpkin. - Livestock include chickens, ducks, pigs, and sheep. - Livestock and peanuts are for commercial purposes. - High labor demand for peanut cultivation. - Farms range from as small as 0.25 acres to as large as 10 acres. - Considering the geographical layout of the communities, farms are situated some distance away from homes, ranging from 500 m from home to as far as 22.5 km. - Most farms are kept for subsistence purposes; in some cases, excess produce is sold for small income. - Diet of the population is also supported by hunting and fishing. 	<ul style="list-style-type: none"> - Unpredictable weather patterns (floods and drought) affect farming patterns, as villages are located along areas with annual flooding natural dynamics. - Difficulty acquiring loans and grants because of limited knowledge, services are not available close to the villages, and collateral is lacking. Land is communally owned and therefore not easy to use as collateral. - Poor road infrastructure. - Poor access to market. - Lack of irrigation infrastructure. - Pests and diseases, especially for cassava and peanut, when farmers select planting in occasionally flooded areas.

Table 2. Farming systems at the surveyed sites in Regions 3 and 9, Guyana.



Photo: CIAT/GeorginaSmith

In Region 9, cassava, cash crops (horticulture), banana, plantain, and corn (maize) are mostly cultivated. Farm sizes in this region on average range from 0.25 to 5.0 acres. Considering the geographical layout of the communities, farms are located at a distance of 500 m to as far as 22.5 km away from the homestead. Farming inputs are shared among residents and families, for example, cassava tubers are the main crop cultivated in Rupununi as an ancestral crop for more than 600 years. Peanut farmers, however, are required to purchase their planting materials and hire labor, as this is a new labor-intensive crop for the region and is cultivated only for commercial purposes.

Reciprocity remains a key pillar in the social structure of indigenous communities, largely due to the general nature of the culture, geographical and environmental setting. In agriculture, this is expressed in the practice of Mashramani. Generally communal efforts take place in farming, in which the owner of the farm cooks and prepares traditional drinks and people assist in preparing and planting the farm.

Cattles are generally free range, therefore, feed largely on the savannah grasslands with commercial feeds sourced from Georgetown used as supplements. Communities are also adopting improved pastures.

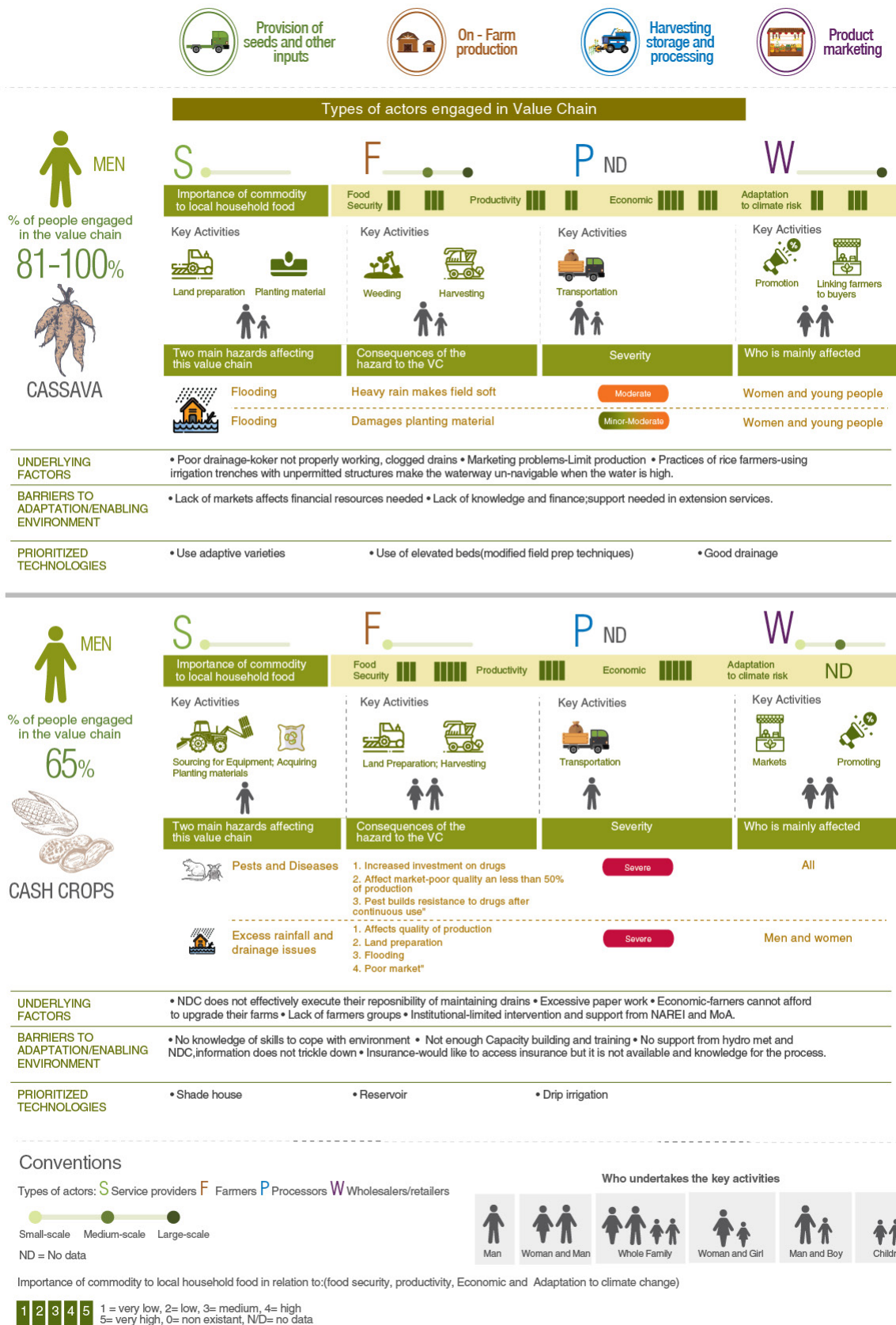
Table 3 presents the five most important crops in each zone surveyed. Cassava is the most important crop that is cultivated in both Regions 3 and 9. However, the value chain development of cassava is limited and, in most of the zones, processing and value addition are in their infancy and carried out at the household or community level. In North Rupununi, cassava cultivation is done mainly in vegetated areas (patches of forest) to allow for shade and fertile soils. It is argued that the savannah is not fertile enough to produce good-quality cassava. However, in Central Rupununi, we were able to see the cassava crops in savannah, at Nappi an extensive part of the crop was burnt during the last dry season.

Rank	Region 3: West Demerara	Region 9: Annai	Region 9: Nappi	Region 9: Sand Creek
1	Cassava (C)	Cassava (C)	Cassava (C)	Cassava (C)
2	Pineapple (C)	Cash crops (horticulture) (S)	Cash crops (horticulture) (S)	Ground provision (S)
3	Rice (C)	Corn (maize) (S)	Peanut (C)	Peanut (C)
4	Plantain (C)	Banana (S)	Plantain (S)	Corn (maize) (S)
5	Ground provision (C)	Plantain (S)	Citrus (S)	Banana (S)

Table 3. The five most important crops across the surveyed sites in Regions 3 and 9 of Guyana.

Note: C = grown mainly as a cash crop; S = grown mainly for subsistence.

3.2.1 Region 3: West Demerara Workshop



MEN

% of people engaged in the value chain

65%



CASH CROPS

S	F	P ND	W
Importance of commodity to local household food	Food Security 	Productivity 	Economic
Key Activities  Sourcing for Equipment; Acquiring Planting materials	Key Activities  Land Preparation; Harvesting	Key Activities  Transportation	Key Activities  Markets Promoting
Two main hazards affecting this value chain	Consequences of the hazard to the VC	Severity	Who is mainly affected
 Pests and Diseases	1. Increased investment on drugs 2. Affect market-poor quality an less than 50% of production 3. Pest builds resistance to drugs after continuous use*	Severe	All
 Excess rainfall and drainage issues	1. Affects quality of production 2. Land preparation 3. Flooding 4. Poor market*	Severe	Men and women

UNDERLYING FACTORS • NDC does not effectively execute their responsibility of maintaining drains • Excessive paper work • Economic-farmers cannot afford to upgrade their farms • Lack of farmers groups • Institutional-limited intervention and support from NAREI and MoA.

BARRIERS TO ADAPTATION/ENABLING ENVIRONMENT • No knowledge of skills to cope with environment • Not enough Capacity building and training • No support from hydro met and NDC,information does not trickle down • Insurance-would like to access insurance but it is not available and knowledge for the process.

PRIORITIZED TECHNOLOGIES • Shade house • Reservoir • Drip irrigation

Conventions

Types of actors: S Service providers F Farmers P Processors W Wholesalers/retailers

Small-scale Medium-scale Large-scale

ND = No data

Importance of commodity to local household food in relation to:(food security, productivity, Economic and Adaptation to climate change)

1 2 3 4 5 1 = very low, 2= low, 3= medium, 4= high
5= very high, 0= non existant, N/D= no data



Man



Woman and Man



Whole Family



Women and Girl



Man and Boy

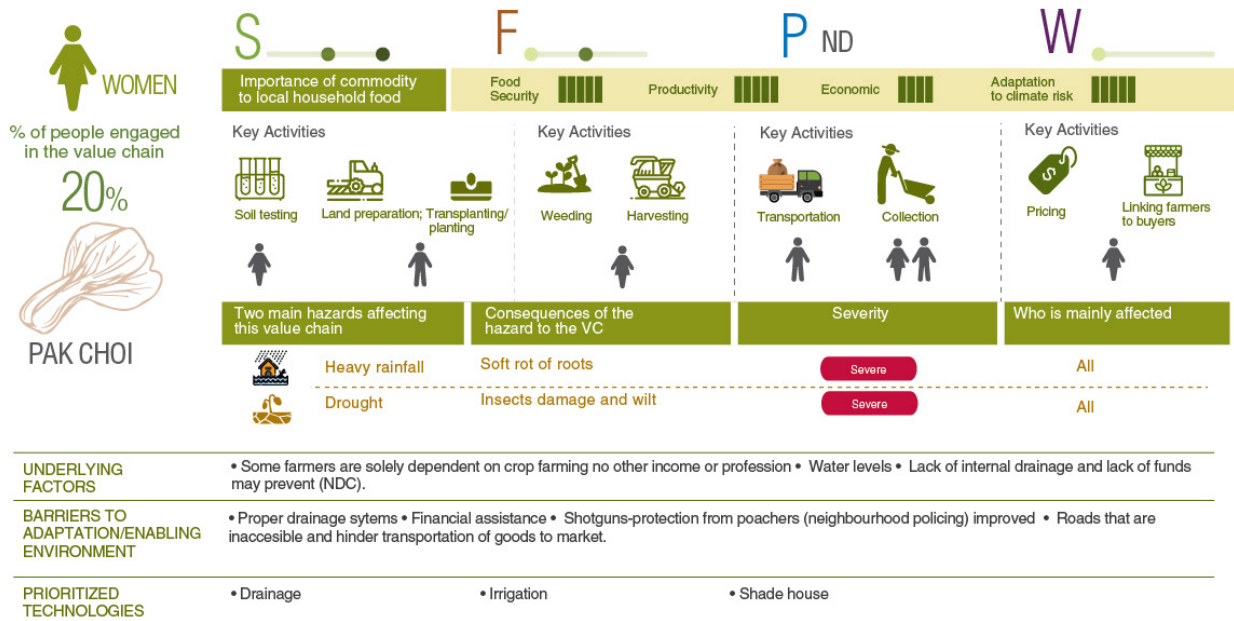
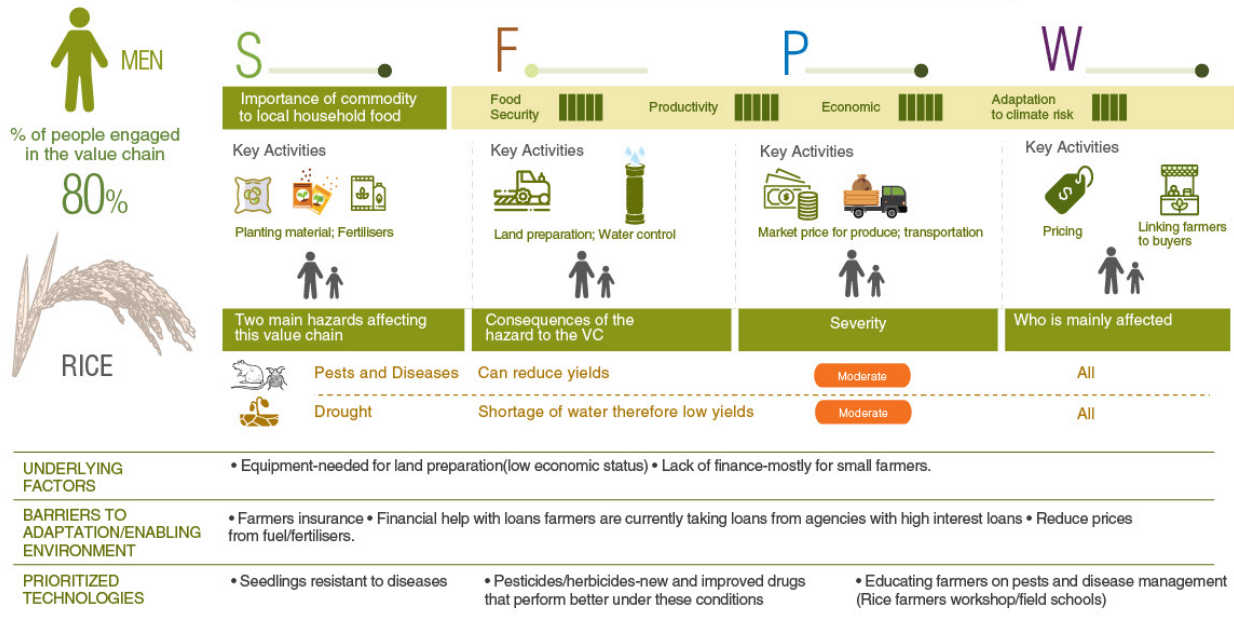


Children

Figure 3. Value chain characterization of cassava and cash crops selected as important crops by men in West Demerara, Region 3.



Types of actors engaged in Value Chain



Conventions

Types of actors: **S** Service providers **F** Farmers **P** Processors **W** Wholesalers/retailers

● Small-scale ● Medium-scale ● Large-scale

ND = No data

Who undertakes the key activities



Importance of commodity to local household food in relation to: (food security, productivity, Economic and Adaptation to climate change)

1 2 3 4 5 1 = very low, 2= low, 3= medium, 4= high, 5= very high, 0= non existant, N/D= no data

Figure 4. Value chain characterization of rice and pak choi selected as important crops by men and women, respectively, in West Demerara, Region 3.



Photo: CIAT/Neil Palmer

In Region 3, the men selected rice, cassava, and cash crops as their most important crops (Figures 3 and 4). Men and their sons work together on rice farms and take responsibility in fishing. The women selected cash crops, particularly pak choi, as the most important crops (Figure 4). Cash crop farming involves the entire family, including women and children. Cash crops commonly grown in this region are pak choi, collalo, white pepper, bora, cucumber, broccoli, squash, sesame, pumpkin, peanuts, sweet pepper, carrot, okra, celery, thyme, cabbage, kale, cauliflower, radish, watermelon, and lettuce. Farmers identify cash crops as important because they mature quickly and have a high demand in the local market. The farmers prefer value chain commodities that are easy to manage, are profitable, have market availability, and save labor.

Women farmers prefer cash crops because of their low demand for labor and they can be cultivated on plots around the homestead. Rice fields are usually located far from the village and, in the case of plantain, women have difficulty in harvesting the fruit. Cassava is processed in the community to produce casserip (a sauce, which is also a preservative used in a meat-laden stew) and kaley (cassava bread) for subsistence use. The role of women

in farming in Region 3 is centered on pricing the produce, seeking markets, and negotiating prices. In some cases, daughters, sons, and fathers are collectively involved in preparing the crops (making parcels and packaging) prior to taking them to the market. However, most farmers indicated that agriculture is not a livelihood option they would like their children to become involved in because of the financial difficulties they face.

Agricultural practices currently used by farmers in Region 3 are slash and burn, crop rotation, farmyard manure, improved drainage, shading, seed selection, certified seed, and inorganic fertilizers. Underlying factors for vulnerability include the lack of insurance for both crops and livestock, limited knowledge among farmers, lack of credit services, and low purchasing power for inputs such as fuel and fertilizer. The stakeholders prioritized drip irrigation, construction of reservoirs, drainage channels, effective pumps for use in drainage, raised beds, and shade houses as suitable agricultural practices. Although loans and grants are available along the coast, the requirements are difficult for farmers; hence, a large proportion of farmers are inconvenienced, making it difficult for them to intensify agricultural activities for increased production.

3.3.2 Region 9: North Rupununi (Annai) Workshop

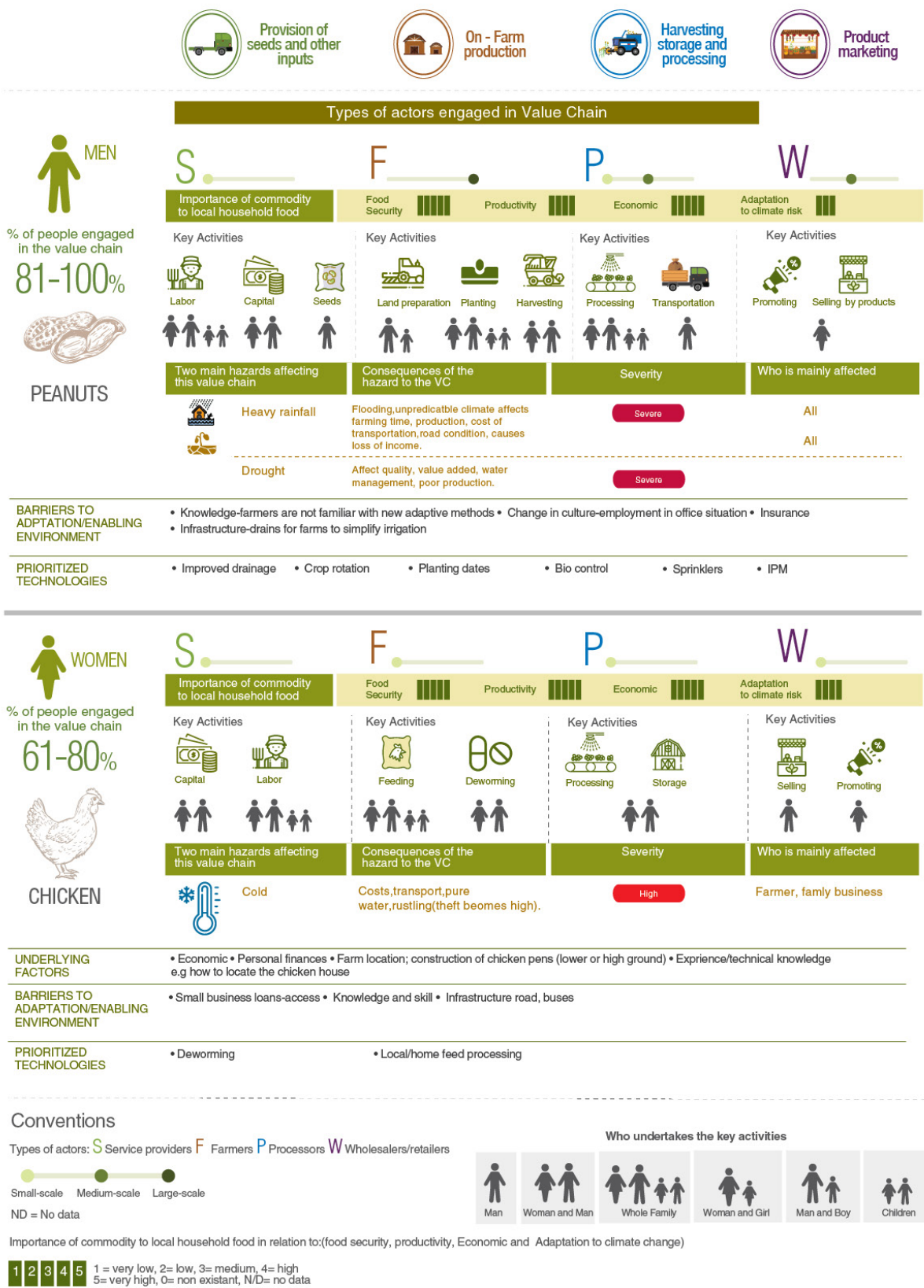


Figure 5. Value chain characterization of peanuts and chicken selected as important commodities by men and women, respectively, in North Rupununi, Region 9.



Provision of seeds and other inputs



On - Farm production

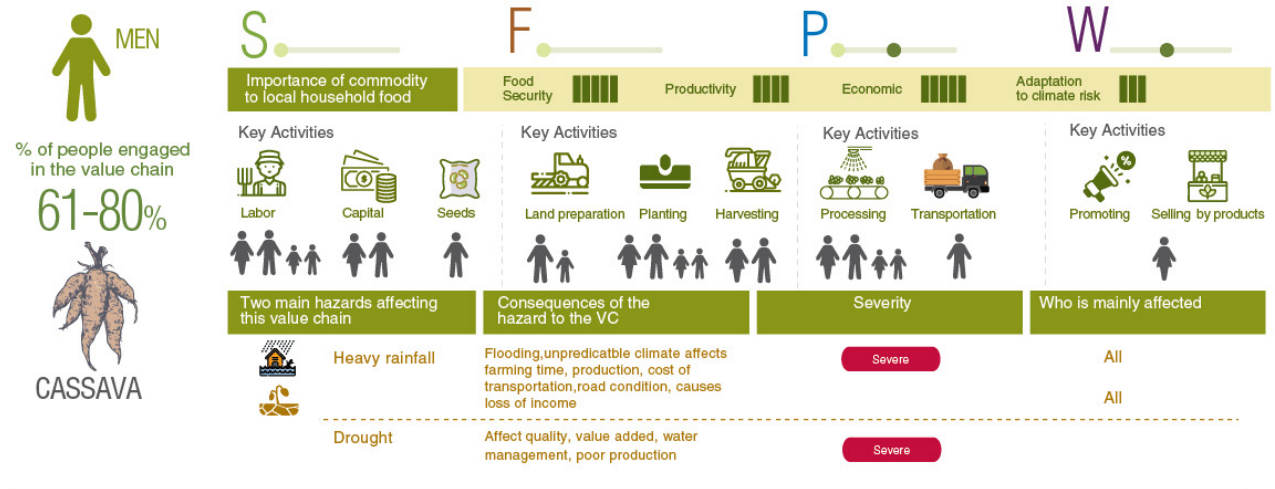
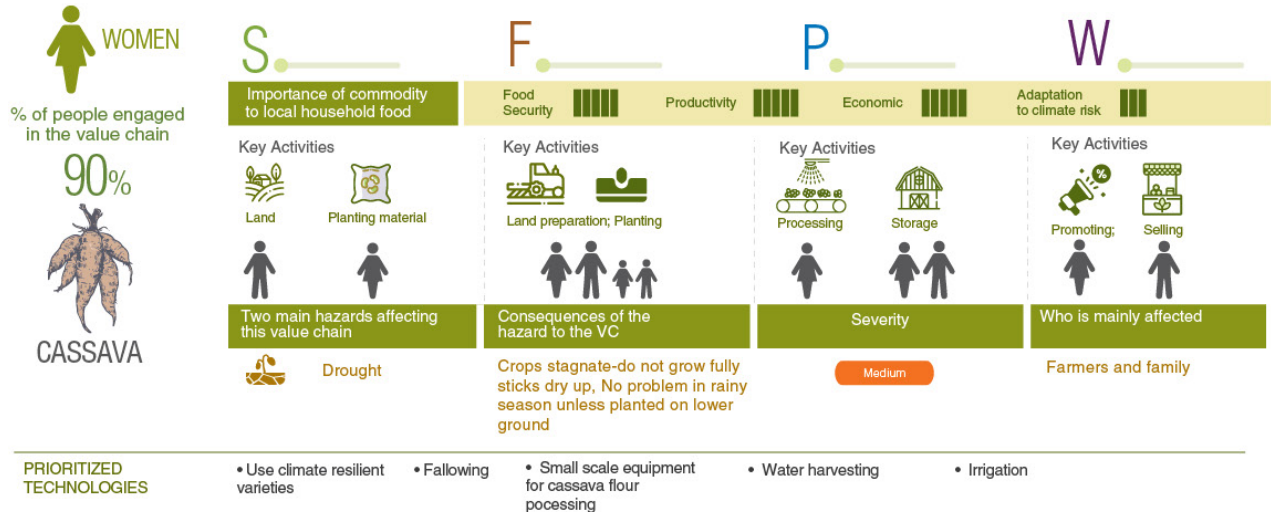


Harvesting storage and processing



Product marketing

Types of actors engaged in Value Chain



Conventions

Types of actors: S Service providers F Farmers P Processors W Wholesalers/retailers



ND = No data

Importance of commodity to local household food in relation to:(food security, productivity, Economic and Adaptation to climate change)

1 2 3 4 5 1 = very low, 2= low, 3= medium, 4= high 5= very high, 0= non existant, N/D= no data

Who undertakes the key activities



Figure 6. Value chain characterization of cassava selected as an important crop by both men and women in North Rupununi, Region 9.

In North Rupununi, cassava is an important crop for both men and women. The second most important value chain is chicken for women and peanut for men (Figures 5 and 6). Farmers indicated that there has been a decrease in cassava cultivation over the past 15 years because of a change of diets to rice and because of the increased focus on education. People are seeking higher education and white-collar employment, which has reduced the number of farmers in Rupununi as people move away from traditional agricultural livelihoods.

Women are key decision makers in identifying the varieties of cassava or other crops to be cultivated and in what land parcel. Women remain responsible for processing activities, relying heavily on other females

in the family for assistance. They are also important in sourcing for markets.

Farmers indicated that promising adaptation practices are drip irrigation, drainage, and water management to deal with floods. In addition, there is a need to promote extension services, capacity building, crop rotation, drought- and flood-tolerant varieties, community seed banks, integrated pest management, and small-scale mechanization. The communities are wary of harvesting water from wetlands due to the long-term negative effects on the ecosystem. The wetlands of North Rupununi play an important role in the groundwater recharge of headwaters of the Rupununi River, a tributary of the Esequibo River in Guyana.



Photo: CIAT/Neil Palmer

3.3.3 Region 9: Central Rupununi (Nappi) Workshop

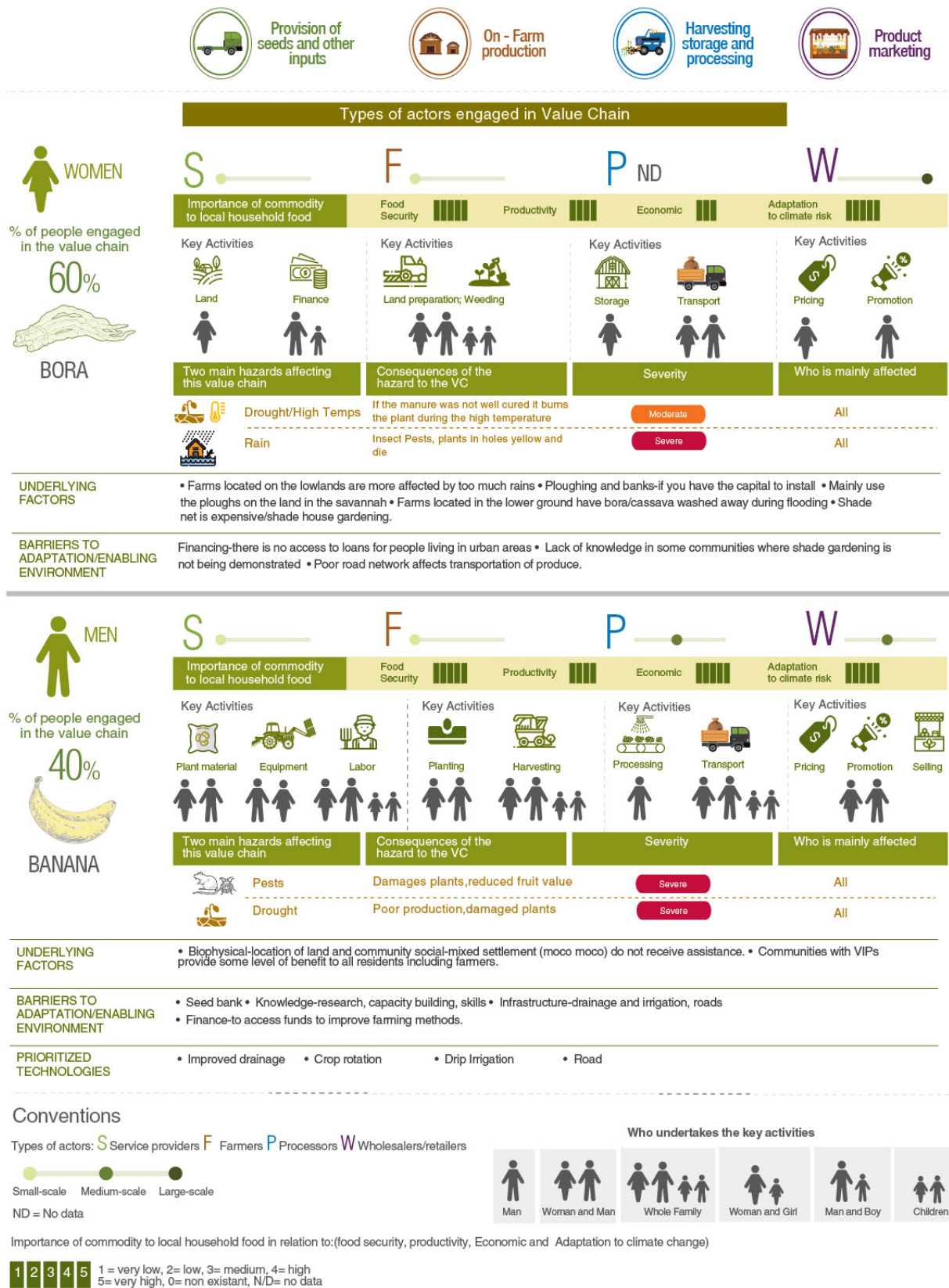


Figure 7. Value chain characterization of bora and banana selected as important commodities by women and men, respectively, in Central Rupununi, Region 9.



Provision of seeds and other inputs



On - Farm production

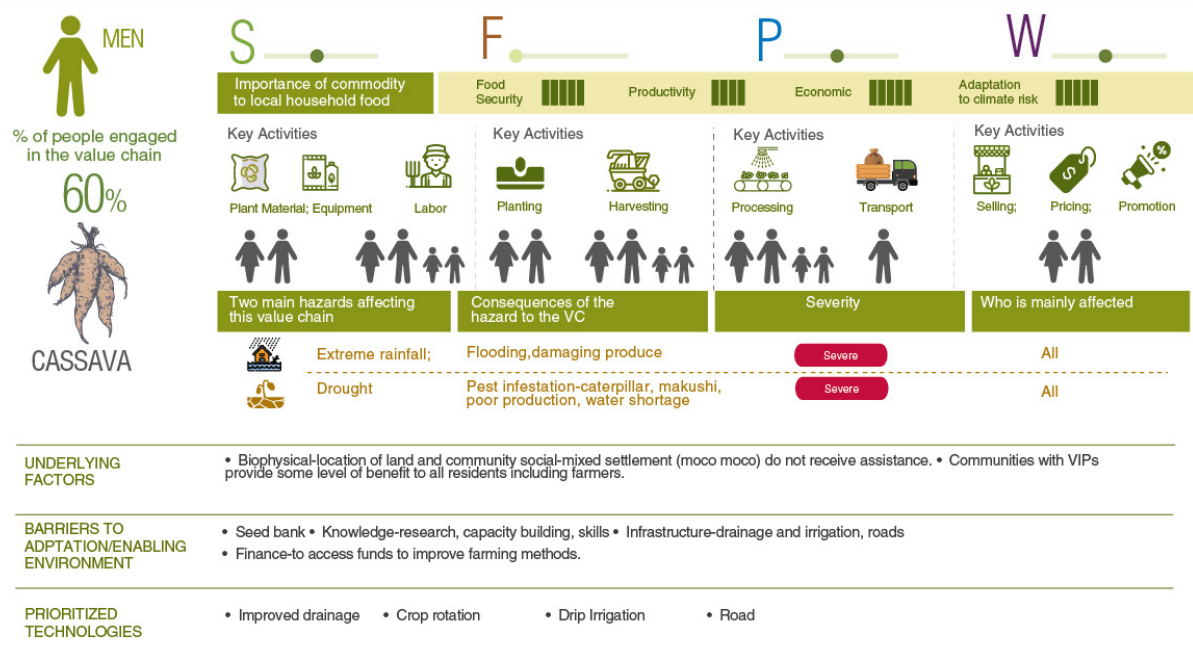
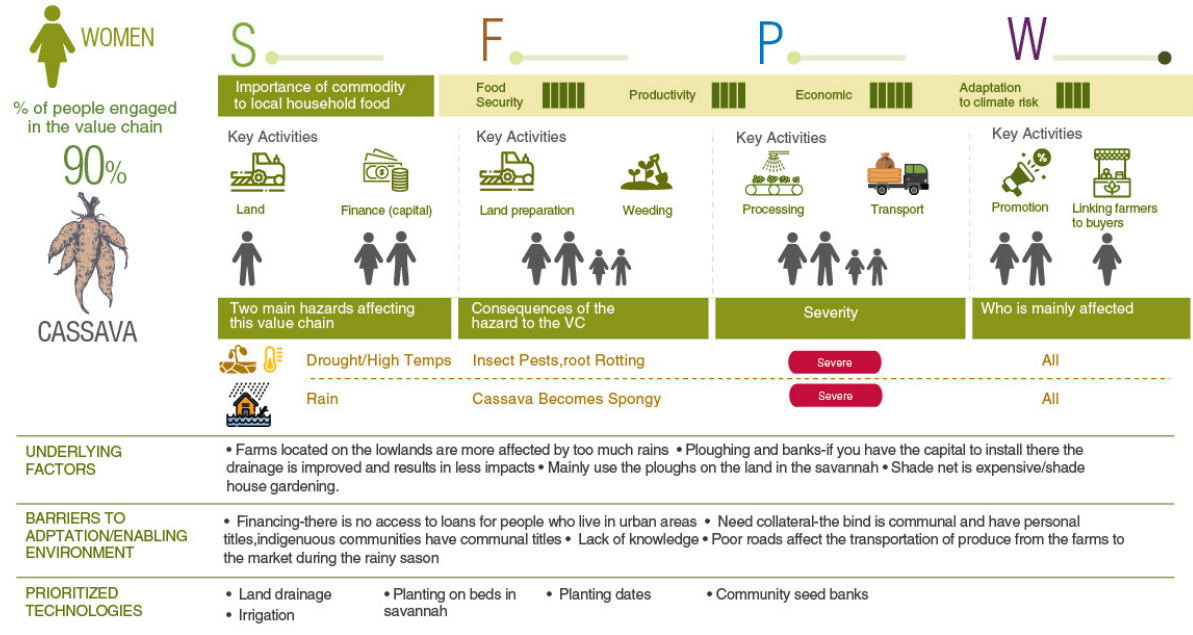


Harvesting storage and processing



Product marketing

Types of actors engaged in Value Chain



Conventions

Types of actors: S Service providers F Farmers P Processors W Wholesalers/retailers

Small-scale Medium-scale Large-scale
ND = No data

Who undertakes the key activities



Importance of commodity to local household food in relation to:(food security, productivity, Economic and Adaptation to climate change)

1 2 3 4 5 1 = very low, 2= low, 3= medium, 4= high
5= very high, 0= non existant, N/D= no data

Figure 8. Value chain characterization of cassava selected as an important crop by both women and men in Central Rupununi, Region 9.

Farmers in Central Rupununi prioritized the cultivation of cassava (Figure 8). In addition, the men selected banana as an important crop, while the women identified bora (Figure 7). Cassava is preferred because it is resilient to the changing climatic conditions and grows easily in the savannah environment. Farmers indicated the need for soil testing to support the identification of other suitable crops.

Most activities in the farming of the selected crops involve the entire family, particularly in on-farm production, postharvest processing, and marketing (Figures 7 and 8). Hired labor is sometimes required for larger farms during ploughing, weeding, and transportation. The traditional system of Mashramani or communal assistance is also used to offset cost, particularly during land preparation and harvesting.

Farmers are currently cultivating only two varieties of cassava. This is the long-term effect of cassava tubers loss due to flooding and fire. Farms located on lowlands are more prone to flooding. Farmers noted that different

varieties are used to produce different products. Cassava can be cultivated for a period of 3 years depending on the fertility of the soil. Banana can be cultivated in the same locations as cassava for a period of 3 to 20 years, which lowers productivity because of recycled seed. Bananas are cultivated by rows 8 to 10 feet (2.44 to 3.05 meters) apart. Farmers are diversifying by planting one row of banana and one row of cassava, corn (maize), beans, or pineapple.

Farmers indicated the need for drainage, community seed banks, planting on raised beds, irrigation, and improved road infrastructure.

The wetlands of Central North Rupununi play an important role in the ground water recharge of headwaters of the Rupununi River but also in the drainage to the Rio Branco, a tributary of the Negro River from the Amazon River Basin in Brazil. They intermix and have a complex hydrology, especially during flooding extremes.



Photo: CIAT/Caroline Mwangera

3.3.4 Region 9: South Rupununi (Sand Creek) Workshop

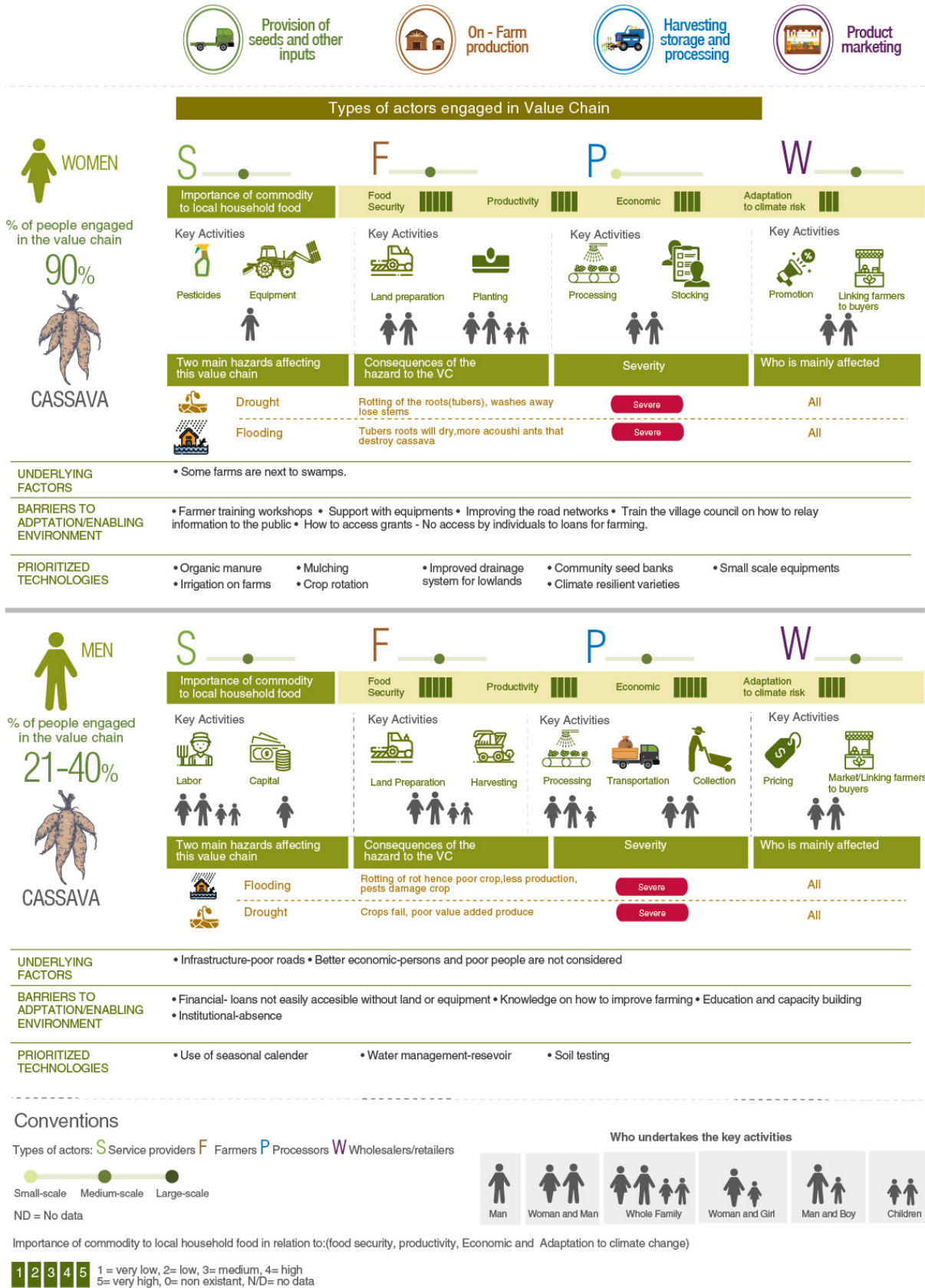


Figure 9. Value chain characterization of cassava selected as an important crop by both women and men in South Rupununi, Region 9.



Provision of seeds and other inputs



On - Farm production

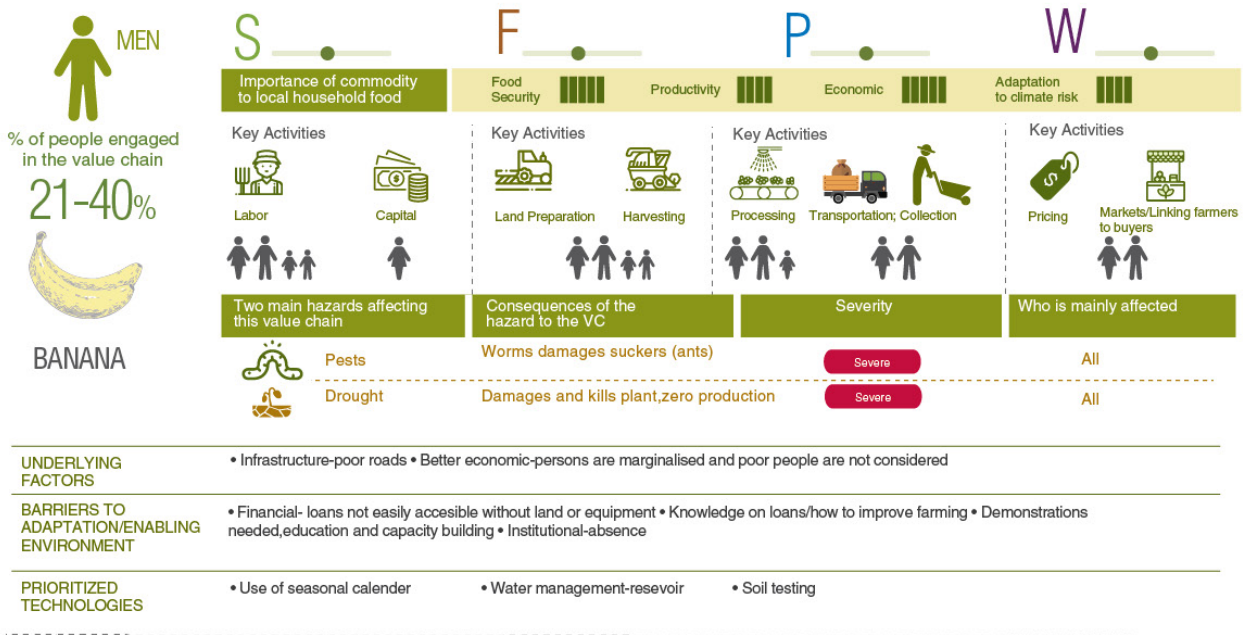
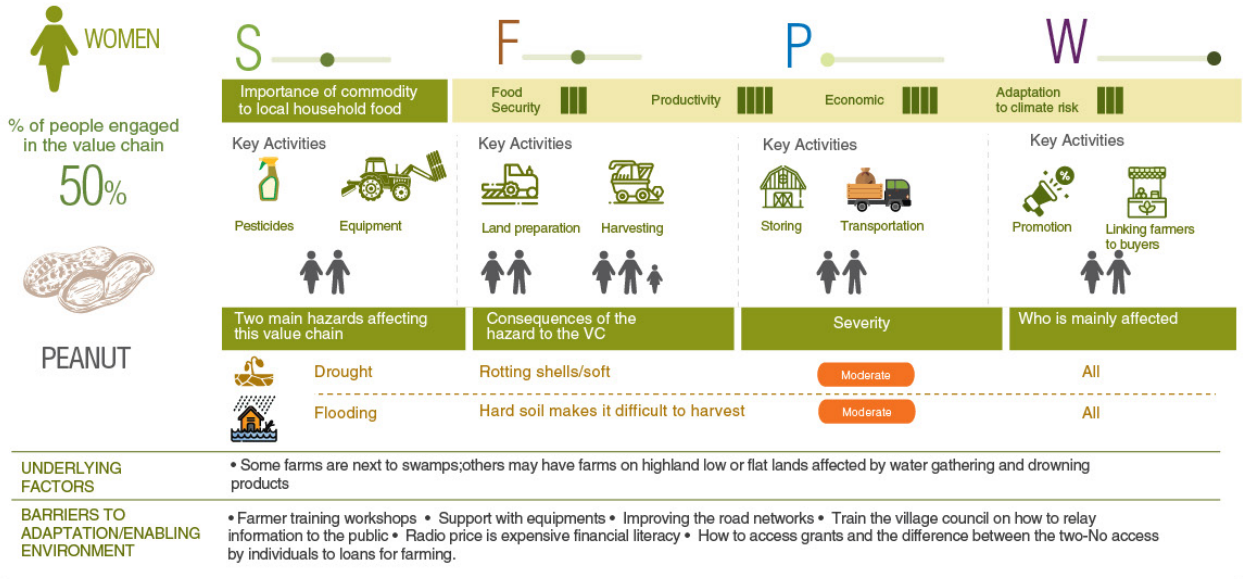


Harvesting storage and processing



Product marketing

Types of actors engaged in Value Chain



Conventions

Types of actors: S Service providers F Farmers P Processors W Wholesalers/retailers

Small-scale Medium-scale Large-scale

ND = No data

Importance of commodity to local household food in relation to: (food security, productivity, Economic and Adaptation to climate change)

1 2 3 4 5 1 = very low, 2= low, 3= medium, 4= high 5= very high, 0= non existant, N/D= no data

Who undertakes the key activities



Figure 10. Value chain characterization of peanut and banana selected as important crops by women and men, respectively, in South Rupununi, Region 9.

Both male and female farmers prioritized the cultivation of cassava (Figure 9) similar to the case in North, Central, and South Rupununi. The women identified peanut, whereas the men selected banana in terms of importance (Figure 10). Both cassava and banana are considered well adapted to local climatic conditions and the savannah environment. Few farmers cultivate peanuts for commercial purposes and mostly use hired labor.

Most agricultural activities undertaken during the cultivation of the crops involve the entire family in land preparation, planting, harvesting, and selling. The traditional system of Mashramani (Makushi, or Manor in Wapishan) or communal assistance is also used, particularly during land preparation and harvesting.

Farmers indicated that the main expenses associated with farming are the cost of fuel and capital spent to prepare meals for communal assistance. Drought is the main challenge faced in cassava cultivation. Cassava is cultivated and processed for subsistence purposes in the form of bread, porridge, and farine.

Banana is mainly cultivated for subsistence use; however, some sale occurs in the community. Banana is cooked in stew, roasted, boiled or fried as chips and is largely used in the school feeding programs. Farmers indicated that worms and other pests infect the banana crop, and there is a need for knowledge on proper pest management.

Men are actively involved in land preparation for cassava. They are also responsible for the cutting of wood for fire, in processing and peeling the tubers, and in transporting the produce from farm to home. The women are usually responsible for processing. The introduction of motorized equipment into the processing of materials has decreased the amount of time required, allowing women to spend more time with children, and this can bring about an increase in production. Young boys also assist in processing and in securing firewood while daughters work with the matapi (squeezing of cassava) and baking of bread and farine.

The location of plots for cultivation is based on the fertility of the soil and the plots are usually away from cattle pastures. Generally, crop rotation is practiced and farmers are interested in knowledge on composting. There is a need for drainage on many of the farms located on low terrains. However, the required equipment is not accessible to farmers. The farmers indicated challenges posed by poor infrastructure and a lack of adequate institutional presence, for example, NAREI to support extension services.

3.3. Climate change impacts on agriculture

Guyana has a tropical hot, humid climate, moderated by northeast trade winds. It has two rainy seasons: the first from May to August and the second from November to January [4]. The topography consists of mostly rolling highlands, savannah, and coastal plains.



THE MEAN TEMPERATURES IN THE UPLANDS AND THE INTERIOR (WEST) RANGE FROM

20 TO 23°C,
WITH THE REST OF THE COUNTRY
HAVING A TEMPERATURE
RANGE OF **25 TO 27.5°C,**

REACHING AS HIGH AS
31°C [14].

Climate data shows that the mean annual temperatures have increased by 0.3 °C since the 1960s, translating into a rate of change of approximately 0.07 °C per decade [14].

THE AVERAGE ANNUAL RAINFALL IS
1,500 TO 2,000 MM.



Natural hazards exist, especially flash floods during the rainy seasons, with the current environmental concern being water pollution from sewage, agricultural and industrial chemicals, and deforestation [4].



MORE THAN **85%**
OF THE COUNTRY IS FORESTED,
MAKING IT GLOBALLY SIGNIFICANT
AS A "NET CARBON SINK" [8].

The coastal region is highly vulnerable to the impacts of climate change, with the country projected to experience two to five times sea-level rise (80 cm to 2 m) vis-à-vis global levels by the end of the century. It ranks as the fourth most exposed country to natural disasters in the Latin America and Caribbean region as a result of high exposure to flooding [8]. In fact, flooding contributes 99.8% to the Average Annual Loss (AAL) by hazard.

Based on socioeconomic baseline data collected on the Island of Leguan (Region 3) in 2016, the area continues to be vulnerable to flooding because of heavy rainfall, spring

and high tides that lead to salt-water intrusion, coupled with poor sea defense infrastructure and increasing temperatures (increased sunshine). More than 80% of the population on the island depends on farming, fishing, and livestock rearing. The population remains vulnerable to flood-related diseases and increased mosquito infestation and loss of personal materials and crops due to extreme weather conditions. Pests and diseases continue to be a threat to farmers, including rice bugs, aphids, and whiteflies that affect vegetables. Acoushi ants, crickets, and other swamp ants are also a great problem and destroy plants. In sour fruit, worms are a common problem and beetles attack in coconut farming. Diseases also affect plantains and banana.

Farmers are aware of climate change, but have limited information about the actual effects of the phenomenon or what it means to be resilient. As a result, farmers are not knowledgeable on what can be done to enhance their farming to cope with climate change. Region 3 farmers do not easily access climate information from the hydro-meteorological office. Although they rely on traditional knowledge to determine climatic conditions, information reaches farmers only from television or radio. As a result, there is a need for a better institutional framework that allows rural farmers to better access climate information. This applies similarly to the role of agricultural extension agencies such as NAREI.

On the other hand, the Rupununi savannah experiences climate extremes, characterized by intense rainfall that leads to flooding and droughts annually. The dynamics of these seasonal conditions are constantly changing and are inflicting adverse effects on indigenous farmers. Annai in Region 9 is among the first communities to have a local radio station that supports broadcasting of weather information three times each day. The district has also developed a seasonal calendar. However, farmers also rely on traditional knowledge and bio-indicators for weather forecasting.

3.4. Gender dynamics

In focus group sessions, women and men from Regions 3 and 9 were separated according to gender and interviewed about their various farming practices. Women were grouped together with the hope that in the same gender group they would feel free to voice their views on working on farms and share their challenges and achievements. The goal was to determine, from comments shared, whether farms differ based on the gender of the individuals heading the farm. The women

were asked to name the crops that they tended to plant and cultivate and to share their reasons for doing so. They shared where the crops were planted and grown, why, and how. It was hoped that the questioning would also help in determining whether there was a need for a greater understanding of the barriers and opportunities for coping with climatic variability by hearing how these variabilities were understood and handled.

3.4.1 Background: From past to present





In the hinterland areas of Guyana, we can see large agricultural estates that from their introduction by European colonialists operate to produce basic staples as well as some exports to the Western world. Land that once produced sugarcane, rice, coffee, and more is now used to produce staples, such as coconuts, plantain, cassava, bora, eggplant, peanuts, and a variety of fruits: mango, papaya, sapodilla, pears (avocado), etc.

The plantation experience then and now presents a clear example of the ways in which the gender division of labor and gender roles can be differentially applied depending on the system of labor organization, the gender and perceived ability of particular individuals. There is less emphasis on defining roles based on race, ethnicity, or nationality of the workers involved [13].

The pay for workers continues to be low and the living conditions for many remain poor. In the rural hinterlands (also where most of the indigenous populations live), the poverty rate in 2006 was 74%, and extreme poverty was 54% vis-à-vis urban and coastal areas, where the rates were 19% and 7%, respectively. A more recent analysis from a 2014 UNICEF study shows similar results in poverty rates.

A lack of employment opportunities is a major problem for both female and male villagers. Official statistics show that about 67% of the men formally employed in the hinterlands work in two sectors: (1) agriculture, forestry, and fishing and (2) mining and quarrying. Women are employed in the educational, food, and agricultural sectors (representing 55% of the employed women). A qualitative assessment showed that most of the women do not have a formal job, and they stay at home taking care of the children and doing small-scale subsistence farming. People in these areas are subject to forced migration in search of job and educational opportunities. Tertiary educational opportunities are, for example, not available close to home. Male migration inevitably leaves women to take care of families on their own for up to three months at a time and, in many cases, the men do not return and do not support their families.

Some of the major characteristics of old-style plantations are still evident in profound ways as outlined below:

-  1 A predominance of personal face-to-face relationships.
-  2 Relationships of dependence and interdependence between female and male workers, who may also be wife and husband.
-  3 An assumption that only able-bodied men can do heavy tasks, women and children the light work, thus devaluing women's labor although women were and still are required to take on much of the heavy work. (During indentureship, plantation owners with this mind-set obtained the labor of two workers and paid for only one and a half [13]. A discriminatory wage structure continues to define and devalue women's labor as less than men's despite the fact that women were and often are forced to labor in fields doing the same tasks as men.
-  4 The actions of the present postcolonial government or state in maintaining structured inequality in relation to the poor maintenance of roads or the lack of roads.

3.4.2 Is farming gendered?

Gender is created and recreated out of human relations and interactions, and gendered relations provide a certain "order" within our social and economic lives. Judith Lorber (1994) [15] tells us that as a *social institution*, gender is one of the major ways that human beings organize their lives. Economically, human society has grown to depend on formulations of what have become predictable or assumed divisions of labor and designated allocation of scarce goods.

Women's work in agriculture was often as important as or more important than their work in biological or social reproduction [13] and, although many were and

continue to be withdrawn into the domestic economy, they, as in the past, assume technical responsibility for cane farming or transforming cane lands to cash crops, market gardening, rice production, and the husbandry of animals, such as chickens, sheep, goats, and cows [13]. They continue to receive no or low wages and are defined and have come to define themselves, particularly if married or living with a man, not as farmers but as women who "assist" with the farming or as "housewives."

3.4.3 Women who farm or women farmers?

In speaking with the women from the various areas, the question about the way they regarded themselves repeatedly emerged. Were they women who farm or women farmers? Few women boldly proclaimed themselves to be farmers. They on the most part appeared to see themselves as women who farm because of the need to "assist" their husbands or male partners by planting cash crops. This was primarily the case for those who were married or living with a male partner, whether or not that partner was actively involved in working the farm. Yet, Makushi and Wapishana women in the southern part of the Rupununi area of Guyana described themselves as powerful, confident, resourceful, skillful, strong, empowered, and committed motivators and advisors with an ability and willingness to share knowledge. Many worked to transform cane lands into cash crops. Some were part of farming groups, full-time and part-time farmers. Some were born into a family of farmers and shared that their grandfathers were cattle farmers, fishermen, and/or farmers of rice and sugarcane. Some wanted the freedom of working in the fields and some studied agriculture at the University of Guyana. All worked on farms and supplemented their income in various ways, such as by selling goods from baking, weaving, sewing, and landscaping. Some worked as domestic workers, teachers, village councillors, shopkeepers, and security officers. Men may farm or do logging or woodworking.

3.4.4 An "acceptable and respectable" division of labor

In Guyana, there are strong views regarding what is acceptable and respectable female and male behaviour. Gender is primarily understood based on visuals – what you see (or think you see) is what/who it is. Gender is policed and gender expression is also policed and, generally, men who feel threatened by women's empowerment and the strength that is relied upon to fell trees and to plough becomes a weapon against the very ones – the women and children – who depend on it. As a result, it is often easier to concede and to be complicit in naming the man as heading the farm and oneself as a virtually insignificant other. In many cases, it is safer

to accept and perpetuate certain cultural norms even as they support social and economic systems of oppression, inequality, and inequity.

3.4.5 What do women do? They farm

Women farm, although most stated that the “hard” labor, such as ploughing, was done by males even if women needed to employ a system of Mashramani, a system of reciprocity that involves exchanging food or home-cooked meals for collaborative work. Many stated that they were not able to do land preparation, planting, weeding, and spraying of crops on their own. Spray cans, for example, were described as heavy to transport on their backs, but some stated that they, nevertheless, would be forced to take on the work if they could not afford to pay or exchange goods for service. Several asserted that, if they were able to own a plough, they would plough. They agreed that some of “those girls do plant, weed, and work the plough, even drive a tractor.” For the most part, however, it appears that when it’s time to plant and reap what is planted, women are often complicit in devaluing their own labor and ability by leaving tasks perceived as more difficult to husbands, brothers, or male community members willing to take on the role. Felling trees, tilling, ploughing, and land preparation are viewed as men’s work but, when it’s time to plant and reap, women and children will “assist.” The division of labor is such that it is accepted that often both women and men will be involved in harvesting and storing crops. Men will be involved in linking with buyers and transporting the goods to the market, while women will often price and sell the goods.

From Good Intent, a village near Linden, located in the capital of the Upper Demerara-Berbice region of Guyana, a woman, who also works as a secretary, “helps” on her father-in-law’s farm by clearing grass and helping to pick the crops. She also helps with applications for small loans to buy seeds and advocates for soil testing. Others assist by obtaining donations from the organization *Food for the Poor* and by washing crops that are brought home. Their contributions are important for food security. Women stated that they are “not pressured too plenty,” but, as long as they are “encouraged and have the mind and strength,” they will do the work on the farms and share in the earnings and any wealth. Adult female children may help with watering crops. Young, old, females and males help with bundling or parcelling out produce for sale at home or in markets.

From Annai in North Rupununi, some women would wake at 5 a.m. and walk 6.4 to 8.0 km to tend their crops. One of the women stated that for more than 20 years she has farmed with her husband and has grown accustomed to walking 21 km to arrive at the farm in order to work from 6 a.m. to 10 a.m. She has planted peanuts, cassava,

pumpkin, and a variety of other vegetables. Others said that they would go early to the farms and aim to return home by 6 p.m. to do other chores such as slaughtering chickens to sell to people in the community. On the farms, some women are involved in felling trees and some carry 5-gallon spray cans and haversacks on their backs when they lack the funds to hire help or engage in the system of Mashramani. For many, walking is the main means of transportation, whereas others use bicycles, motorbikes, cars, buses, or bull carts.

It is evident that, as in the past, strong women will engage in heavy lifting and hard labor. For these women, safety on the road is an issue and, as a result, equipment needed for farm labor such as a cutlass may become a weapon of defense. A bow and arrow or dogs may also provide additional protection from potential attackers.

3.4.6 What do women plant and what else do they do?

Women will plant crops that they experience as “manageable” and grow easily. They, for example, may avoid plantains as a crop that takes too long to harvest and one that needs the help of a man in order to reap. Other crops that they may grow because they do not take much time are pigeon pea, okra, karaila, fig banana, tomato, broccoli, cabbage, pumpkin, peppers, corn (maize), red potatoes, edoes, sugarcane, and cucumber. Women may engage in poultry farming or raise chickens and ducks. They also raise pigs. Women who are willing to keep livestock learn to rope an animal.

3.4.7 Challenges to overcome

People within the farming community are challenged by social injustices that plague majority of society: social and economic growth that leaves behind a large part of the population, infrastructure development that ignores environmental issues, and building codes that provide immediate gratification to property owners but become a liability and environmental hazard in the long term.

Throughout the country, there is no government-monitored and -controlled transportation system and, as a result, masses of people are left to walk long distances or stand at the roadside for long hours attempting to stop a vehicle that can take them where they need to go. Pedestrians are forced to compromise their safety by walking at the edge of roadways or hitching rides. Cyclists on their way to or from work or some who have picked up their children from daycare or school are forced to carry them on the handlebars of bicycles along treacherous roads where drivers constantly veer to avoid potholes but show little concern about colliding with fellow citizens.

In some areas of the countryside and hinterlands, transporting goods postharvest becomes difficult and it is a challenge to navigate through mud up to the knees or on bikes and in buses in the rainy season, especially with severe flooding because of rain and high tides. Malaria and dengue fever resulting from stagnant waters are a threat. Otherwise, people face problems such as drought, acidic soil, fungicide overuse, beetles, worms, and more.

There may be a lot of produce, but as one man in Leguan stated, “There are plenty of greens. People are working. People keeping cows. Fishing. A squash sells for GYD 60 but the rain carries away some and what is left does not sell. To buy, you must have money and, to have money, you need to have jobs.”

3.4.8 Economic, educational, and social programs for growth and development

Much is needed to support growth and development in the farming sectors of Guyana. Schools beyond grade six would help to improve literacy and contribute to higher education for all. Fellowship groups for farmers such as that which exists in Den Amstel, with women who farm full- and part-time, would help to promote the importance of farming and change negative perceptions of farming as a profession. With a change in perceptions, women who are mostly dependent on men as housewives and who stay away from farming because of the low status that farmers are given in society may be motivated to see farming as an important means to sustaining their families and community. In summary, among expressed needs were the following:

- Programs in colleges and universities that help to change the perception of farming, farmers as uneducated and of the lower class.
- Technology and how to integrate it into farming. Integration of technology into farming.
- Irrigation systems and techniques such as drip irrigation.
- Shade houses in every region.
- Knowledge of new and modern ways of doing business.
- Land titles, savings, property, equipment.
- A greater understanding of weather patterns to prevent the current method of guessing.
- Knowledge and support to meet market demands.
- Knowledge of climate-smart practices.

3.4.9 What hinders development in farming sectors

- Pests and poor access to pesticides that are not health hazards for women and men.
- Insecurity.
- Crops stolen by people who are viewed as “taking food out of people’s mouths.”
- Being solely dependent on crop farming and, therefore, not having additional sources of income.
- Lack of well-constructed roads for easy transportation of goods from farm to market and to make villages accessible to visitors and potential customers.
- Lack of education and training, especially for women and youth that increase knowledge and understanding of climatic conditions and about grants and scholarships that may be available to agriculture students.
- Capital to hire extra labor and assist with land preparation, planting, weeding, spraying, and transportation, especially if no males are in the home.
- Costs to travel may often be a deterrent and prevent some from getting goods to markets.
- Not getting produce sold. An example given was of carrying 25 breadfruit to market and returning home with 10.
- Advice regarding applying for and obtaining small business loans. Where to go? What they may be entitled to; learning the difference between a loan and a grant.
- Not being able to afford long boots, gloves, batteries, and protective clothing.

3.4.10 Money

It is important for farmers to make money. On farms that are less than 5 acres, farmers will plant vegetables such as pak choi, celery, lettuce, bora, and other cash crops largely for subsistence farming. Cash crops can be harvested in 6 weeks or less, whereas crops such as cassava will require 6–7 months before being ready for harvest. Planting bora and okra was said to provide “quick money.” It is important for farmers to make money in order to live independently on their farms. Cost, location, and weather determine which crops are planted. Prices fluctuate and are based on cycles, weather, and quality of land, that is, where the land is situated: on high ground where waters will drain easily or on low ground that floods.

It was believed that if the Guyana Marketing Corporation would buy from ten different farmers each week, this

would help farmers make a good profit from what they grow and reap.

3.4.11 Organizational support

There is a need for more detailed knowledge of the support and initiatives that can be obtained from the following organizations, among others. Farmers in the various regions visited were asked to name the organizations that they had been able to access for support with their farming needs. The list below covers some that were named although in many cases it was surprising to find that several farmers had not benefited from the services of most but had only heard the names of the organizations. NAREI workers who traveled with us named travel expenses and navigating the roads as the reason for infrequent visits. Those in the Leguan and Rupununi areas noted that the village council was their primary source of information and support; yet, all too often, information did not filter down.

Caribbean Development Bank (CDB)	Supporting and promoting regional and local, private, and public investments and institutions since 1969-1970.
Canadian International Development Agency (CIDA)	Merged into the Canadian Department of Foreign Affairs in 2013, it initially functioned to administer aid to developing countries.
Food and Agriculture Organization (FAO)	A United Nations organization committed to eliminating hunger, food insecurity, and malnutrition.
Guyana Marketing Corporation (GMC)	Since 1985, shares local, regional, and international marketing information and opportunities; provides a one-stop desk for export documentation; conducts market studies; promotes Guyana's fresh fruits and vegetables, and agro-processed products at trade fairs and the Guyana Shop; provides facilities for the preparation of fresh produce for export.
Inter-American Institute for Cooperation on Agriculture (IICA)	With strong anti-fraud and money laundering policies, supports the efforts of member states to achieve agricultural development and rural well-being.
Ministry of Agriculture, Guyana (MOA)	Promotes and supports the development of crops, livestock, fisheries, and hydrological and meteorological services for the development of the national economy.
The National Agricultural Research & Extension Institute (NAREI)	Focuses on improving crop production/diversification from high-volume-low-income to low-volume-high-income crops such as spices and other cash crops and new vegetables (cauliflower, broccoli, red cabbage, and sweet pepper), through climate-smart agricultural practices inclusive of protected agricultural systems for year-round vegetable production, hydroponics, and drip irrigation.
Amerindian Village Council (AVC)	As of June 2018, Guyana had 178 AVCs that support village development and follow procedures set out by the Amerindian Act.
Women Agro-Processors Development Network (WADN)	A cooperative group that focuses on building entrepreneurial skills and supporting the manufacturing and sale of goods and services at micro and macro levels.



Figure 11. Chinese long bean (Bora).

Nappi, a small but spread-out Amerindian village in the southern end of the North Rupununi savannahs, 32 km from Lethem, has high productivity of bitter and sweet cassava. Bora, a long green bean (Figure 11), is cultivated and, because it is a food staple throughout Guyana, it represents quick income. Surprisingly, the amount of time and labor that go into growing bora is not reflected in its price. Bora can be bought by the bunch from GYD 100. With a good crop yield, women hope to experience, as a result of market demand, better living conditions, a good income, food security, and growth and expansion of what for many are small businesses.

Table 4. Some organisations identified for support of agriculture in the study areas.

3.5. Policies for climate change adaptation

Various strategies and policies aim to promote climate-smart initiatives and reduce the carbon footprint. The Green State Development Strategy: Vision 2040 is a comprehensive national development policy that covers 20 years. It aims at “an inclusive and prosperous Guyana that provides a good quality of life for all its citizens based on sound education and social protection, low-carbon and resilient development, and new economic opportunities, justice, and political empowerment” [12]. Other documents are the Climate Resilience Strategy and Action Plan (CRSAP) and the Disaster Risk Management Plan for the Agriculture Sector 2013-2020. The CRSAP helps in identifying key climate risks and priority resilience-building actions.

The National Climate Change Policy and Action Plan (NCCPAP), which contains 19 policy objectives aims at addressing adaptation, mitigation, resilience building, and risk reduction. The objectives are clustered around nine policy directives [14]. The National Adaptation Strategy of Guyana provides an action plan to reduce climate change risks for the agricultural sector through innovation and diversification. It highlights Guyana’s thrust to diversify the sector, away from traditional crops (rice and sugarcane) to the production of vegetables (e.g., tomatoes), oilseeds (coconuts and peanuts), roots and tubers (cassava), fruits (e.g., mangoes), and herbs (spices).

3.6. Institutional mapping and network analysis using Venn diagrams

Institutional mapping using Venn diagrams provides a visual tool for assessing information and resource flows within communities. The graphics below highlight not only which institutions provide what services and information but also how well these institutions are linked. Farmers were asked to indicate the core activities of the institutions and rank the importance of each actor. These exercises were performed as gender-disaggregated to understand whether these networks differed by gender.

A. Region 3

The women’s group in Region 3 ranked Propel, NDIA, RDC, Partners of the Americas, and CARDI as the most important organizations with regard to the services they provide in support of agricultural production (Figure 12). Concerning institutional linkages, RDC and NDIA work closely together. In addition, Propel, Partners of the Americas and CARDI have close institutional linkages.

REGION 3: PAK CHOI WOMEN FARMERS

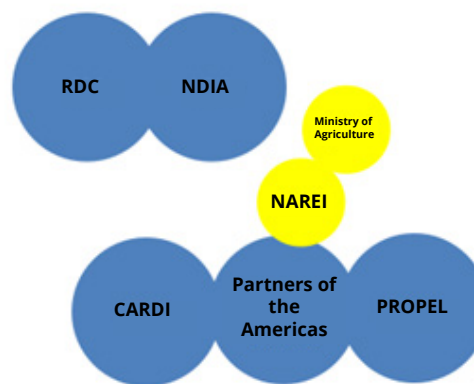


Figure 12. Institutional mapping and linkages as detailed by the women’s group in West Demerara, Region 3. Blue circles denote institutions ranked of high importance and yellow circles those of low importance.

Male rice growers mapped a different set of institutions that they interact with as compared with those listed by the female farmers in the same region (Figure 13). FAO, IPED, Hydromet, the Ministry of Agriculture, and GRDB were ranked as the most significant. This was followed by GSA, which has medium importance, and Gaysuco, of low importance. It is noteworthy that all these institutions work closely with each other.

REGION 3: RICE

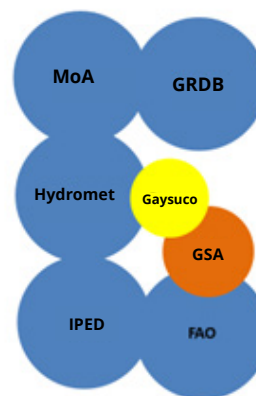


Figure 13. Institutional mapping and linkages as detailed by the men’s group cultivating rice in West Demerara, Region 3. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

A separate institutional mapping exercise was carried out with male cash crop farmers representing Region 3 (Figure 14). The group identified six main institutions whose services support the production of cash crops in the region. NAREI, NDI, and PTCB were ranked as having high importance. FAO and GLDA both had medium importance. GMC was ranked as having low importance

and the farmers perceived that it was not linked with other organizations supporting cash crop value chain commodities (Figure 14).

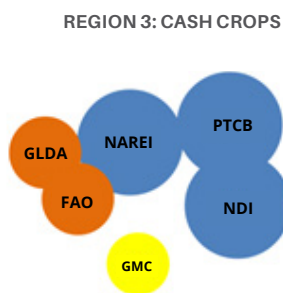


Figure 14. Institutional mapping and linkages as detailed by the men’s group growing cash crops in West Demerara, Region 3. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

The women’s group in Annai identified a large number of institutions that support agriculture compared to the results from the other groups. The most important institutions were the Ministry of Agriculture, NAREI, GLDA, NRDDDB, village council, MOIPA, and RDC. UNDP and WADN were listed as having medium importance. The support of CIDA, CI Guyana, IICA, FAO, and HESAD is currently low compared with that of other institutions supporting female farmers in the region (Figure 15). Figure 15 also highlights institutions that have close linkages (shown with the circles touching each other).

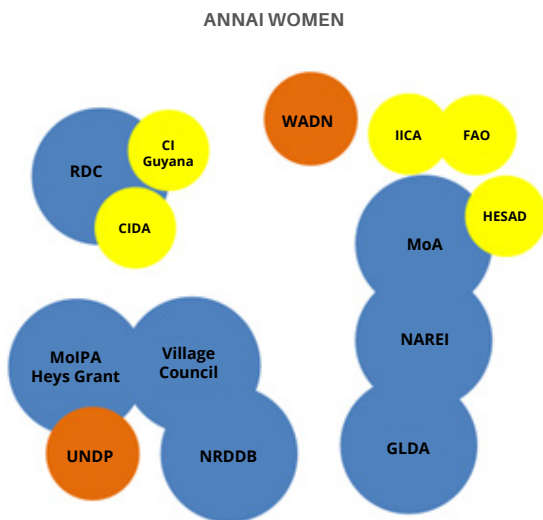


Figure 15. Institutional mapping and linkages as detailed by the women’s group in Annai, Region 9. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

B. Region 9: North Rupununi, Annai

The male group mapped fewer institutions than the female group (Figure 16). MOA, NAREI, and MOIPA have high importance. FAO, Hydromet, HESAD, and PICSA have medium importance and CI has lower importance (Figure 16).

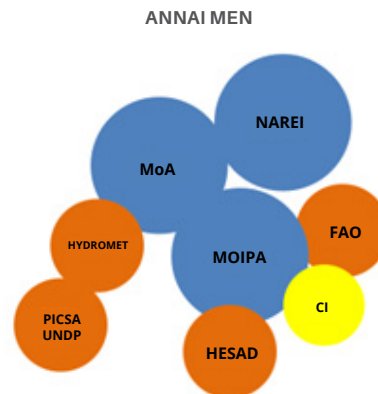


Figure 16. Institutional mapping and linkages as detailed by the men’s group in Annai, Region 9. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

C. Region 9: Central Rupununi, Nappi

In Nappi, the women’s group indicated that institutional presence in the region was low and the support they were currently receiving was less than they required. In this regard, they did not identify any institution with high importance in terms of the services it was providing to support agriculture. The village council is ranked as having medium importance. GLDA, NAREI, GLDA, and NDIA all have close linkages but low importance (Figure 17).

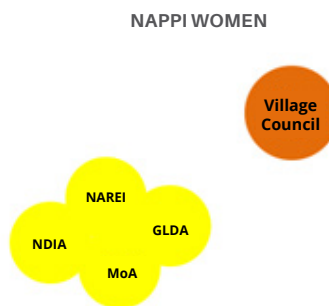


Figure 17. Institutional mapping and linkages as detailed by the women’s group in Nappi, Region 9. Orange circles indicate medium importance and yellow circles low importance.

In Nappi, the male group denoted linkages between GRDB, NAREI, NDIA, and GLDA. Unlike for the women’s institutions, the men ranked MOIPA, GRDB, and NAREI as important institutions in accordance with the services they

are providing. NDIA has medium importance and GLDA currently provides less support than the other institutions that are interacting with male farmers (Figure 18).

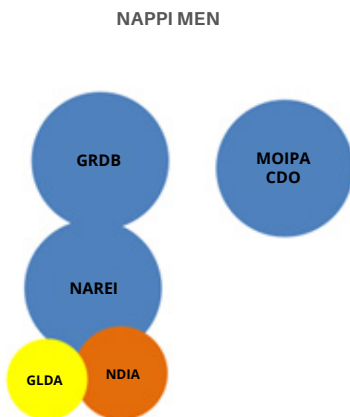


Figure 18. Institutional mapping and linkages as detailed by the men’s group in Nappi, Region 9. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

D. Region 9: South Rupununi, Sand Creek

The institutional map developed by the women’s group in Sand Creek reveals high importance of the village council. Linkages are close between the village council, UNDP, NAREI, and MOA. The Ministry of Health and UNDP have medium importance whereas the support farmers receive from MOA and NAREI is lower than from the other institutions that the group identified (Figure 19).

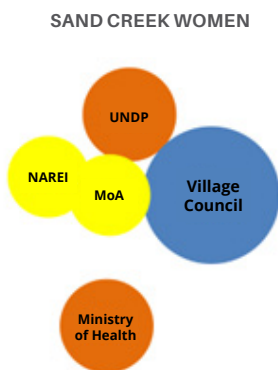


Figure 19. Institutional mapping and linkages as detailed by the women’s group in Sand Creek, Region 9. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

Similar to the views expressed by female farmers in Nappi, the male group in Sand Creek indicated that institutions present in the region provide less support in agriculture than what the farmers require. NAREI has medium importance. The men’s map indicates that RDC

has low importance and works closely with RCCI and KMCRG (Figure 20).

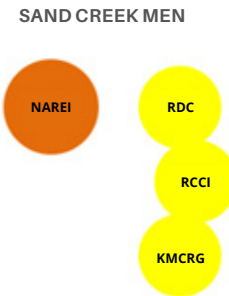


Figure 20. Institutional mapping and linkages as detailed by the men’s group in Sand Creek, Region 9. Blue circles denote institutions ranked of high importance, orange circles those of medium importance, and yellow circles those of low importance.

3.7. Overcoming agricultural challenges at the surveyed site

From the workshops and farmer interviews, we identified several opportunities to address existing challenges:

1. Provide market infrastructure and access. The improvement of connectivity such as by improving the road network and bridges is a key factor that can decrease food loss and waste and improve agricultural income. New Guyana Marketing Corporation was identified as an institution that can support farmers to resolve market problems.
2. The integration of cooperatives for farmers to assist in bulk purchases of crops would reduce transportation cost. Cooperatives can also support aggregation of produce for marketing and provide a model through which support can be provided along the value chain. The cooperative model can also close the gap in availability of services close to the communities, which is because of the limited presence of agriculture-related institutions.
3. Provide irrigation infrastructure.
4. Provide affordable credit facilities.
5. Provide knowledge on climate-smart agricultural practices.
6. Increase the number of agricultural extension staff.
7. Provide climate information, including short-term forecasting.
8. Improve the drainage system.

9. Build defenses to prevent salt-water intrusion from the Atlantic Ocean.
10. Use water pans/wells to provide water for livestock.
11. Use herbicides to control weeds brought by too much rainfall.
12. Increase potential for developing commercial agriculture, especially in horticulture.

Stakeholders participating in the workshops prioritized the most suitable climate-smart agricultural practices, taking into account context-specific factors such as ease of implementing, desired impacts, climate, topography, gender roles, and responsibility. Table 5 contains the prioritized list of practices for the different value chains and agricultural contexts.

Region	Value chain	Prioritized practices
3	Cassava	<ul style="list-style-type: none"> • Resilient varieties (drought and flood) • Raised beds • Improved drainage
	Cash crops	<ul style="list-style-type: none"> • Shading • Reservoirs • Drip irrigation • Improved drainage
	Rice	<ul style="list-style-type: none"> • Disease-/pest-tolerant varieties • Integrated pest management
9	Peanuts	<ul style="list-style-type: none"> • Improved drainage • Crop rotation • Appropriate planting dates • Integrated pest management • Irrigation
	Poultry	<ul style="list-style-type: none"> • Vaccination • Proper feeding and feed formulation
	Banana	<ul style="list-style-type: none"> • Improved drainage • Crop rotation • Drainage • Climate-proofed roads
	Cassava	<ul style="list-style-type: none"> • Drainage • Appropriate planting dates • Crop rotation • Community seed banks • Improved varieties • Small-scale services • Digital/mobile extension services

Table 5. List of climate-smart agricultural practices prioritized by farmers.

3.8. Policy implications

Official statistics show that about 67% of the men formally employed in the hinterlands work in two sectors: (1) agriculture, forestry, and fishing and (2) mining and quarrying. Women are employed in the educational, food, and agricultural sectors (representing 55% of the employed women). A qualitative assessment showed that most of the women do not have a formal job and they stay at home taking care of the children and doing small-scale subsistence farming. The lack of employment opportunities is a major problem for both female and male villagers.

1. Market mechanisms were the main driving force in the dynamics of poverty, with implications for food security. Farmers were not able to make enough money to access inputs required to plant in the next season. This was attributed to the high cost of credit, lack of market information, and the effect of farm-level brokers who offer poor prices.
2. Adoption of technologies was closely related to their economic value; hence, farmers prioritize practices that improve their economic status.
3. Biophysical properties of the farm clearly matter in the adoption of improved or climate-smart technologies. Practices that ignore or interact poorly with the local biophysical or social conditions may not achieve adoption.
4. Social dynamics are of great significance, for instance, practices and technology that have low energy demand will promote the engagement of women and valuing of their participation in agriculture.
5. Closing the gap in attaining higher education is important to address. Helping community/local groups access and use external resources may strengthen the ability of local organizations to foster knowledge and the adoption of CSA practices. Local institutions operating in the area can act as a starting point for mobilizing farmers for learning due to the existing structures of cooperative work (Mashramani), social networks, and ties.
6. Women in general have less access to and control over economic and productive resources such as agricultural produce, credit, and land than men do. Therefore, long-term commitment is required for capacity building and should be responsive to community priorities, needs and demands.
7. Gender dynamic is an important consideration for development, and this includes women’s participation in decision-making processes at all

levels. Beyond their participation, access to and ownership of resources is important if interventions seek to effectively include women in the multiple levels of agricultural production. To this end, gender mainstreaming should target the multiple levels and complex processes that encompass agricultural production. For example, marketing of agricultural produce is considered men's activity since women are perceived to be poor negotiators. This indicates the need to empower women with negotiating skills and to provide market information. As well, women have fewer opportunities to obtain capital and this limits their involvement in cultivating crops such as pineapple that require high capital investment. This indicates the need to address the multiple levels of inequality at both the family and community level.

8. Farmers reported purchasing seed subsidies to cope with climate vulnerability. Government and relevant stakeholders should improve response in assisting vulnerable groups during food-deficit months. The high dependence on a single livelihood source and few crops needs to be addressed.

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