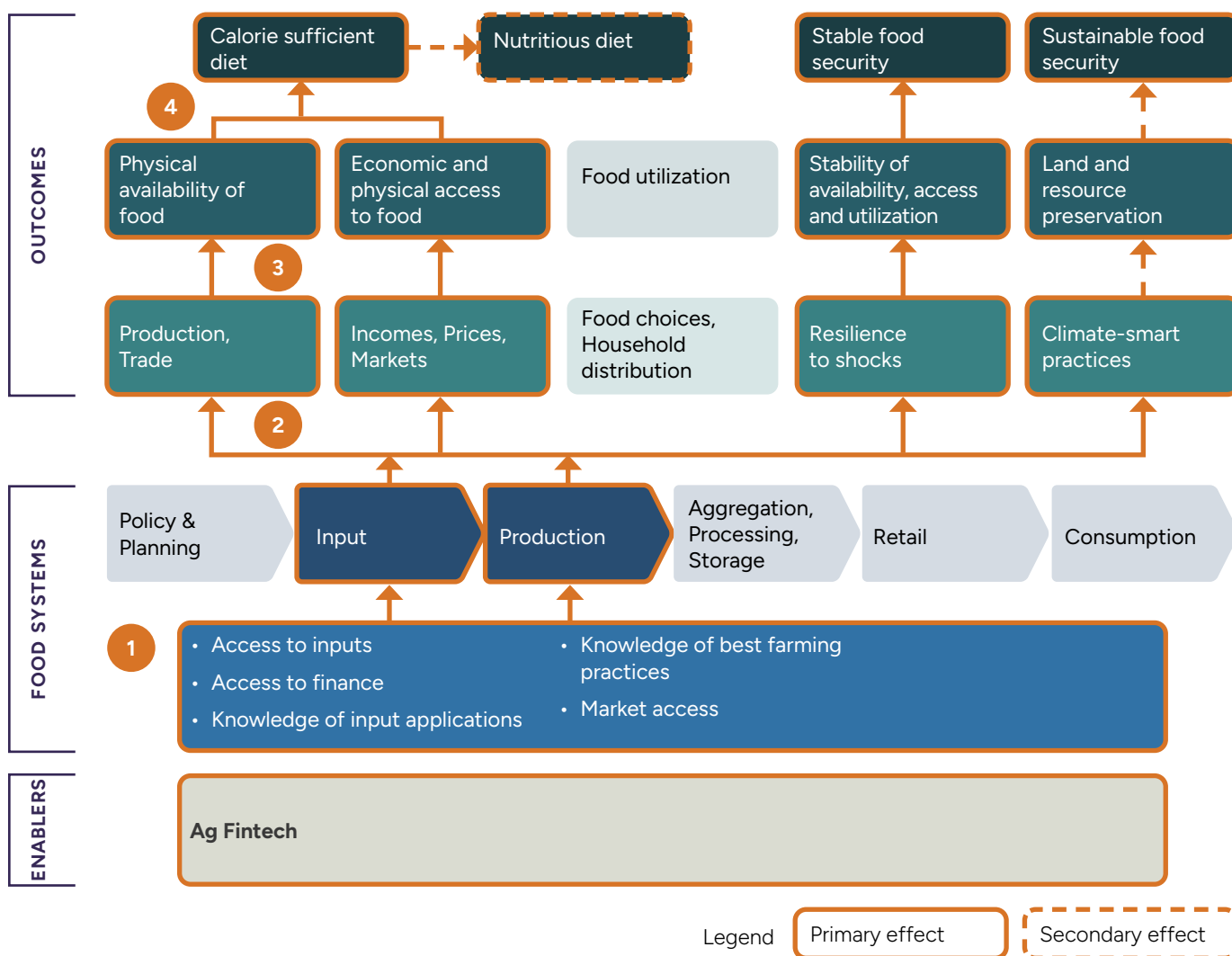


ANNEX

# AgTech Categories and Their Contribution to Food Security Dimensions

Expected incidence of the adoption of various AgTech categories on each of the food security dimensions as revealed by CGAP's logic model.

FIGURE A1. Ag FinTech



**Overview**

**Definition:** Specialist FinTechs providing a broader bundle of services, including advisory or market linkage

**Target Clients:** B2C – farmers and cooperatives

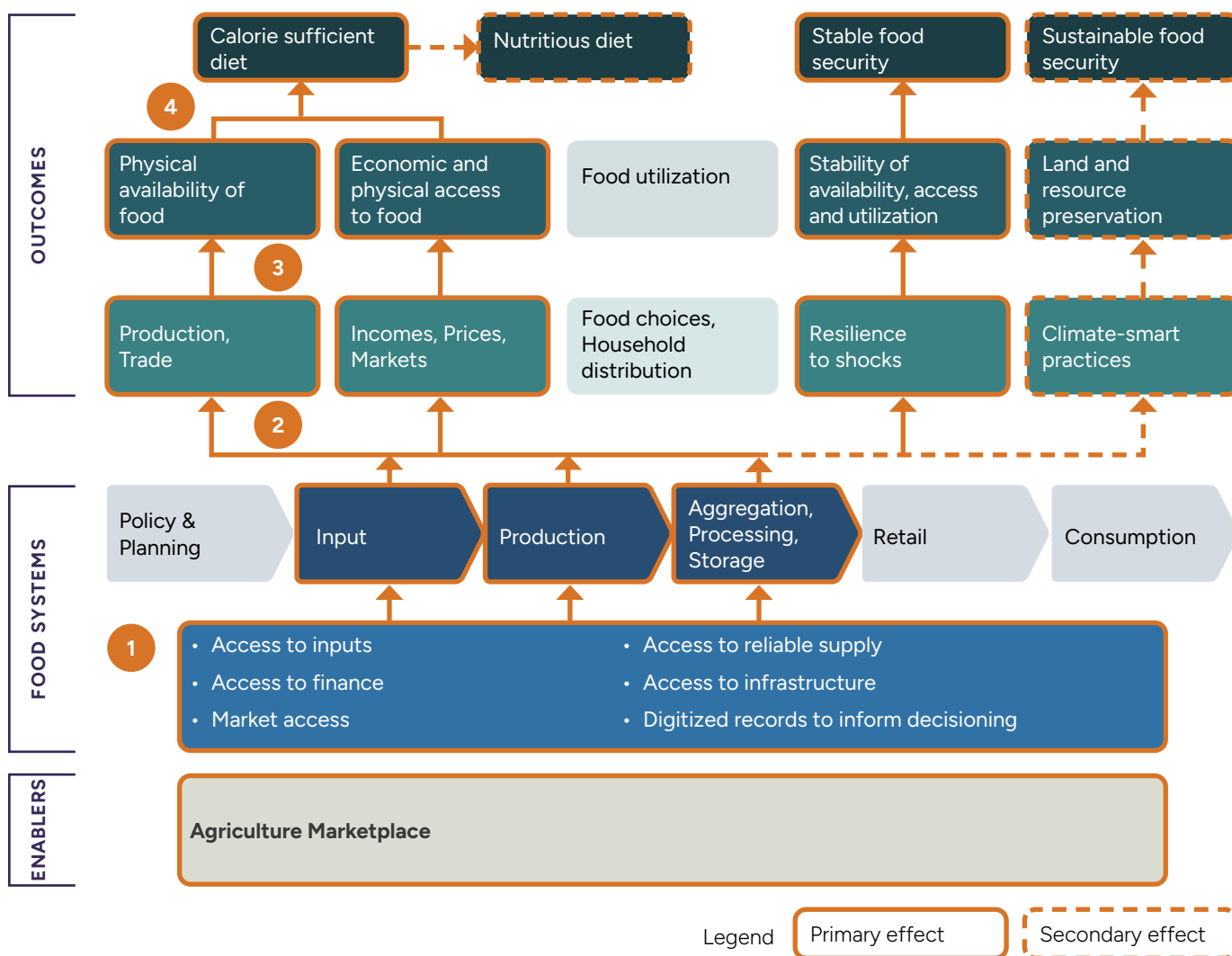
**Market Penetration:** MEDIUM – variety of solutions present in LMICs

**Causal Chain Explanation**

1. Ag FinTechs provide financial services (e.g. credit and insurance products), typically accompanied by inputs, agronomic training, market access and other value-add services.
2. These B2C solutions often target smallholder farmers and farmer cooperatives at the input and production levels.
3. Through the suite of solutions provided, these AgTechs can boost production quantity and quality, while improving market access and increasing incomes for farmers. This can lead to improvements in both the physical availability of food and economic access to food.
4. If providing drought resistant or climate smart inputs, they can improve resilience to shocks. Additionally, if accompanied by knowledge of climate-smart farming practices, these can lead to improvements in stability and land / resource preservation.
4. Through this, consumers have improved access to calorie sufficient diets, and in certain cases, a nutritious diet when increased productivity is accompanied by diversification into healthier crop types. Furthermore, if providing adapted inputs and climate smart practices, Ag FinTechs can improve stability and sustainability of food security.

Source: Authors.

FIGURE A2. Agriculture Marketplace



**Overview**

**Definition:** Digital platforms that connect agriculture value chain participants to products or service offerings. Many digital platforms link farmers to input providers, off-takers, wholesalers, and/or bundled service offerings

**Target Clients:** B2C – farmers and cooperatives

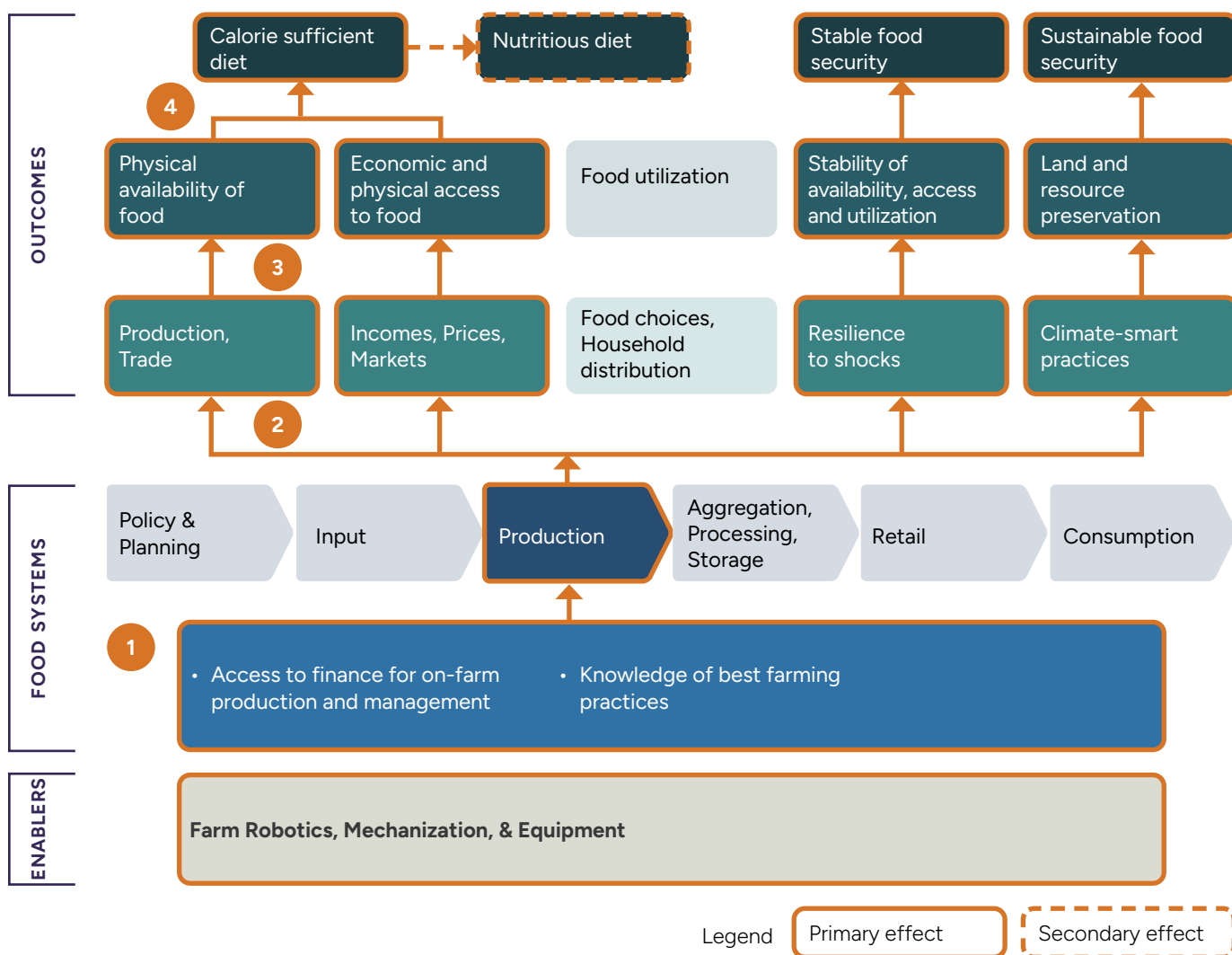
**Market Penetration:** HIGH – many solutions in LMICs

**Causal Chain Explanation**

1. Agricultural marketplaces provide varied products and services offerings to smallholder farmers, including inputs, farm equipment, or offtake channels.
2. These B2C solutions often target smallholder farmers and farmer cooperatives at the input and production levels, while linking off-takers and wholesalers at the aggregation, processing and storage level.
3. Agriculture marketplaces often improve production through better inputs and increase market access and incomes for farmers. This increased market access can lead to improvements in both the physical availability of food and economic access to food. If providing drought resistant or climate-smart inputs, they can improve resilience to shocks and adoption of climate smart practices, leading to improvements in stability and land / resource preservation.
4. Through improved availability and accessibility, end consumers have improved access to calorie sufficient diets. Additionally, if providing adapted inputs, these marketplaces can improve stability and sustainability of food security. Furthermore, SHFs have greater purchasing power for more nutritious foods through additional income due to better market access and knowledge.

Source: Authors.

FIGURE A3. **Farm Robotics, Mechanization, & Equipment**



**Overview**

**Definition:** Hardware solutions including digitally enabled on-farm machinery, automation, and equipment

**Target Clients:** B2C – farmers and cooperatives

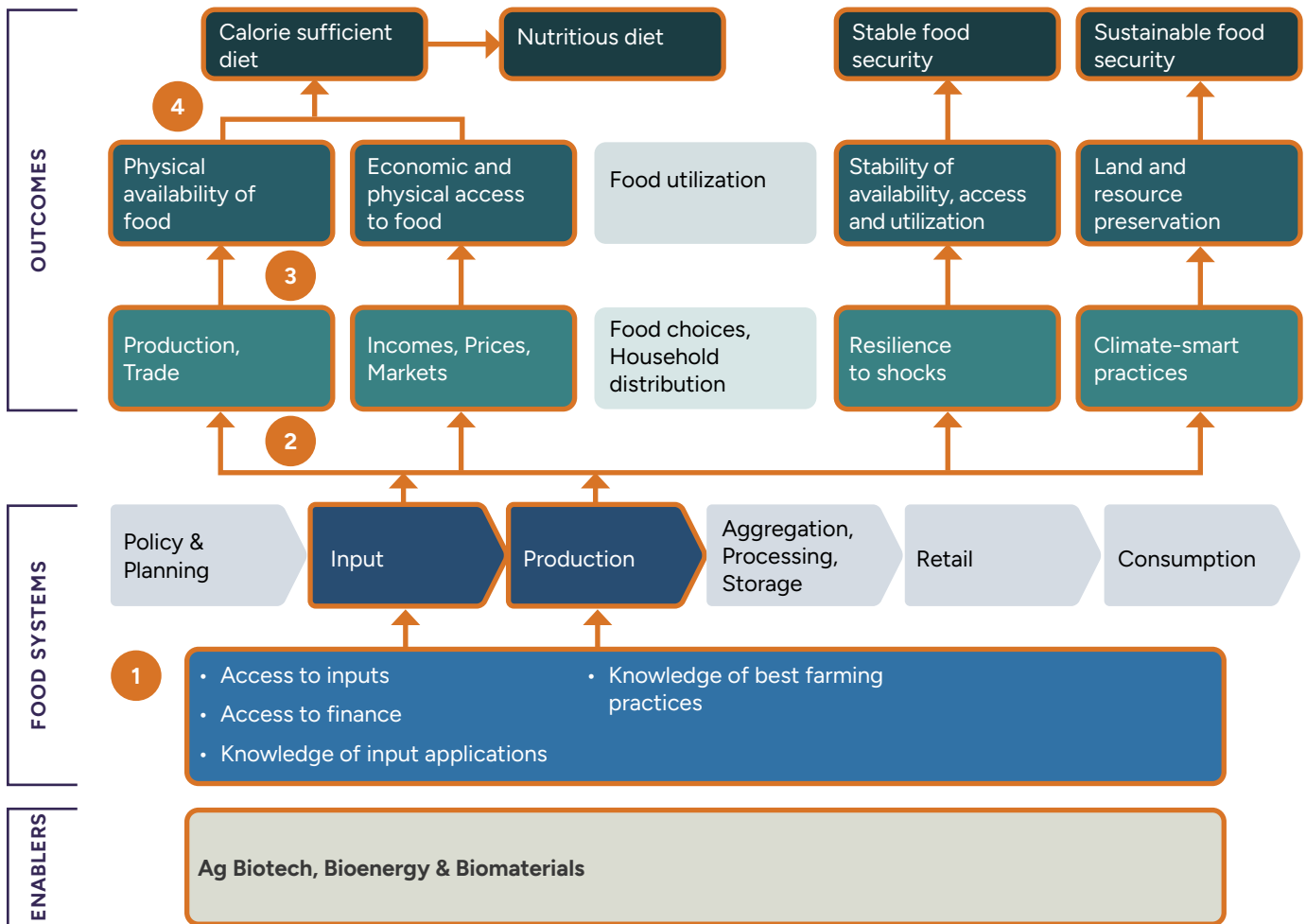
**Market Penetration:** LOW – only a select few solutions present in LMICs

**Causal Chain Explanation**

1. Farm robotics, mechanization and equipment solutions provide machinery/equipment (e.g. tractor mechanization, solar irrigation), financing and training.
2. These B2C solutions often target smallholder farmers and farmer cooperatives at the production level.
3. Through improved efficiency in the production phase, these solutions can boost production quantity and quality, while increasing incomes for farmers. This increased production and market access can lead to improvements in both the physical availability of food and economic access to food. Certain products can improve resilience to shocks and promote climate-smart practices such as improved water usage, leading to improvements in stability and land / resource preservation.
4. Through improved availability and accessibility, consumers have improved access to calorie sufficient diets, and in certain cases, a nutritious diet if increased productivity is accompanied by diversification into healthier crop types enabled by better equipment. Additionally, these solutions can improve stability and sustainability of food security by helping farmers adapt to climate change and practice climate smart practices.

Source: Authors.

FIGURE A4. **Ag Biotech, Bioenergy and Biomaterials**



Legend Primary effect Secondary effect

**Overview**

**Definition:** On-farm inputs for crop and animal ag, novel farming materials, non-food extraction and processing, feedstock technology, hi-tech cannabis pharma

**Target Clients:** B2B2C – agribusinesses; agtechs

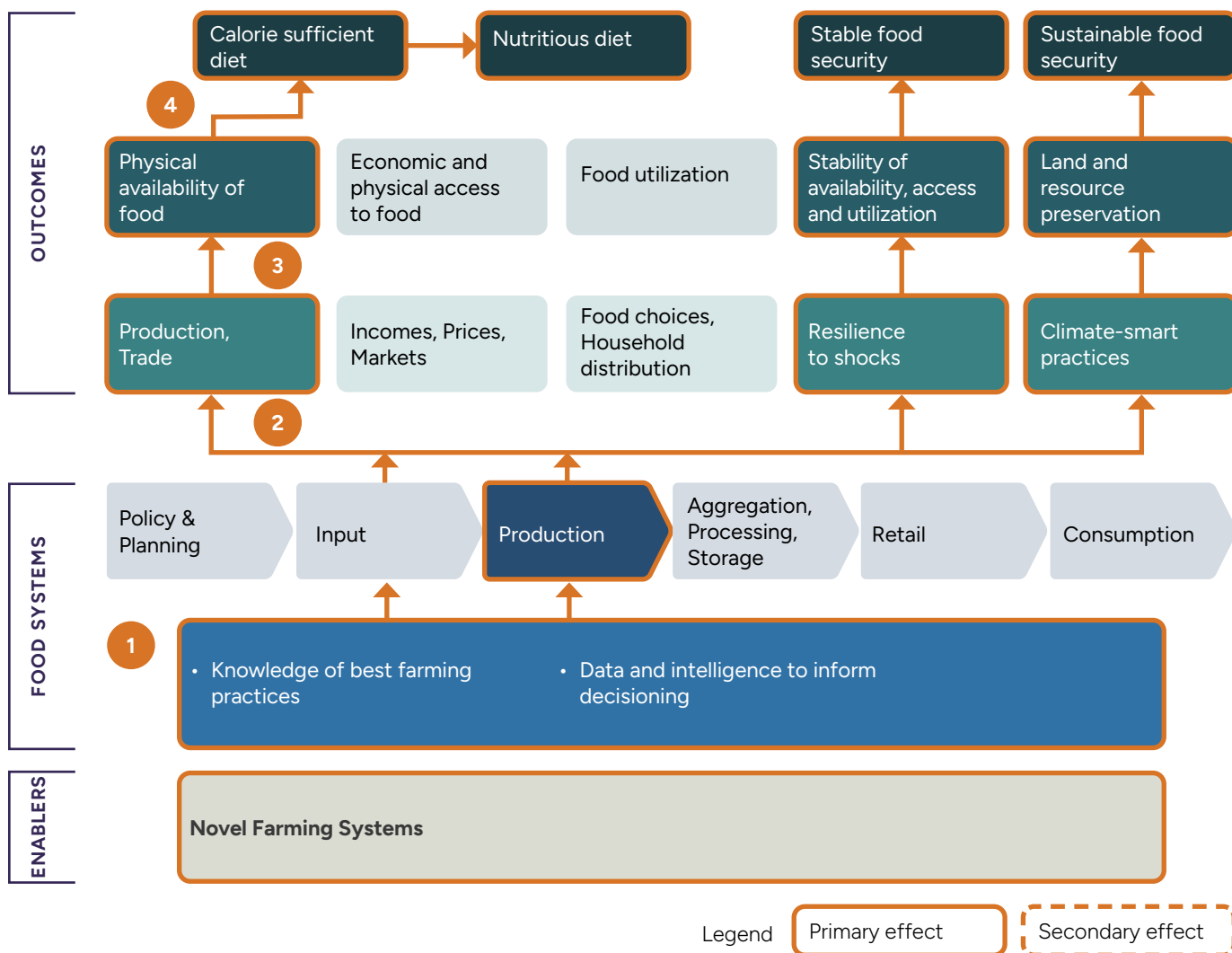
**Market Penetration:** MEDIUM – variety of solutions present in LMICs

**Causal Chain Explanation**

1. Ag Biotech, Bioenergy, & Biomaterials solutions offer adapted on-farm inputs (e.g. drought resilient seeds, organic fertilizer) that help smallholders cope with the changing environment.
2. These B2B2C solutions often develop products and target agribusinesses and AgTechs at the input and production levels, who then distribute to farmers.
3. The adapted nature of many products designed to improve production can boost quantity and quality, while allowing farmers to diversify into other crop types. Adaptive inputs and climate smart biotechnologies can also improve resilience to shocks and adoption of climate-smart practices. Increased production and therefore incomes and resilience can lead to improvements in availability, access, stability and land / resource preservation.
4. These improvements provide consumers with access to calorie sufficient diets, and in many cases, a nutritious diet when increased productivity is accompanied by diversification into healthier crop types and increased incomes enable greater purchasing power. Additionally, adapted inputs can improve stability and sustainability of food security.

Source: Authors.

FIGURE A5. Novel Farming Systems



**Overview**

**Definition:** Solutions offering innovative farming systems such as indoor farms, aquaculture, insect and algae production

**Target Clients:** B2B2C – agribusinesses; farmers

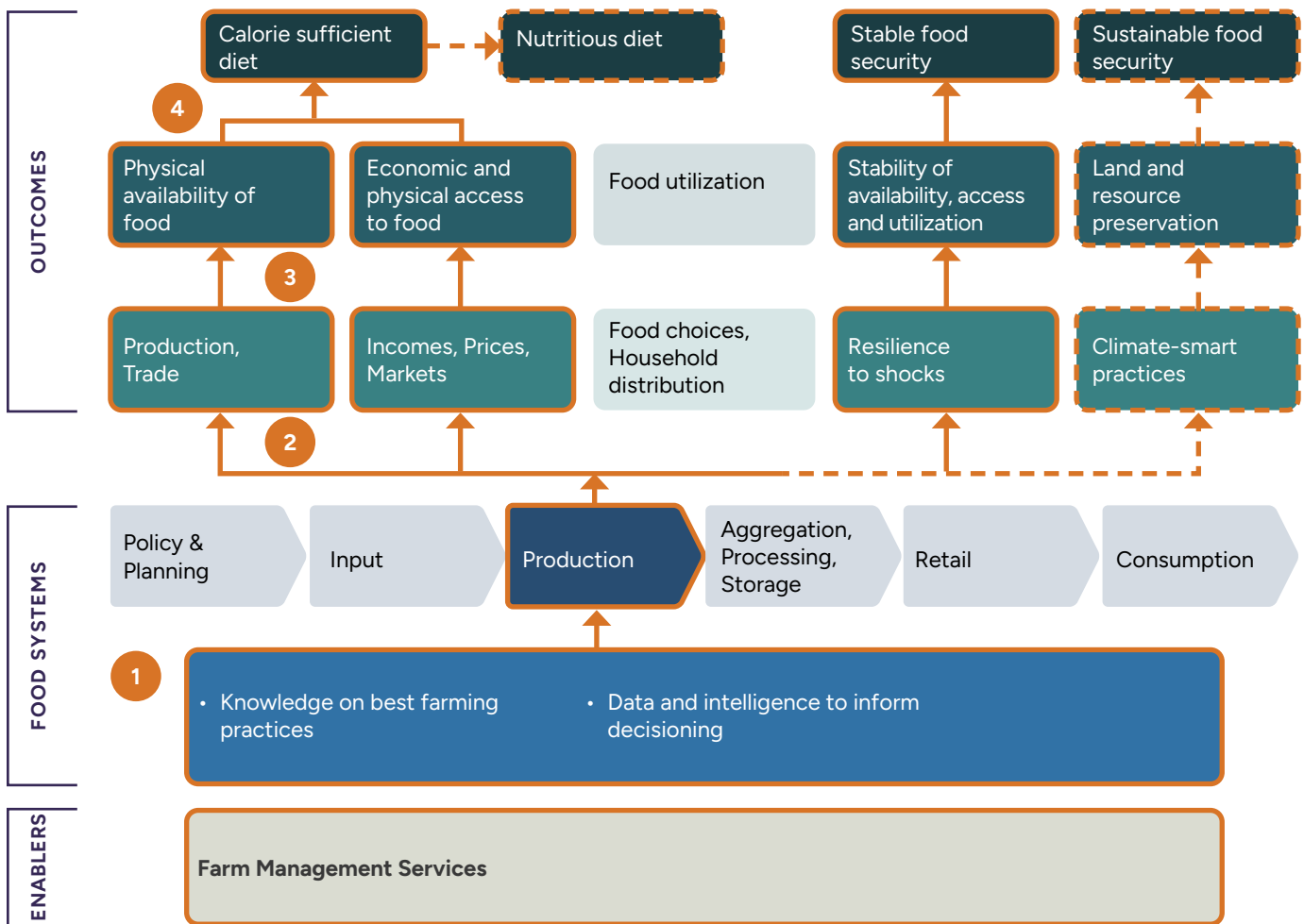
**Market Penetration:** LOW – limited number of solutions present in LMICs

**Causal Chain Explanation**

1. Novel farming systems typically offer alternative farming options such as improved aquaculture, urban farming, and hydroponics.
2. These B2B solutions often target agribusinesses and large farmers at the production level.
3. Depending on the type of solution provided, farm management services can boost production quantity and quality through better practices and technologies. This increased production can lead to improvements in the physical availability of food. Certain farming systems enable farmers to better withstand shocks and promote climate-smart practices, which could improve stability and land / resource preservation.
4. Through improved availability, consumers have improved access to calorie sufficient diets, and in certain cases, a nutritious diet when increased productivity is accompanied by diversification into healthier crop types. Additionally, these systems can lead to more stable and sustainable food security if systems promote sustainable farming practices and help farmers withstand shocks.

Source: Authors.

FIGURE A6. Farm Management Services



Legend Primary effect Secondary effect

**Overview**

**Definition:** Digitally-enabled solutions for the management of on-farm activities, including farmers and agri-SMEs. Specific activities include onboarding, profiling, and managing farmers, providing farmers with up-to-date market information and / or advisory services on agricultural practices, and on-farm ag data capturing devices

**Target Clients:** B2B - agribusinesses

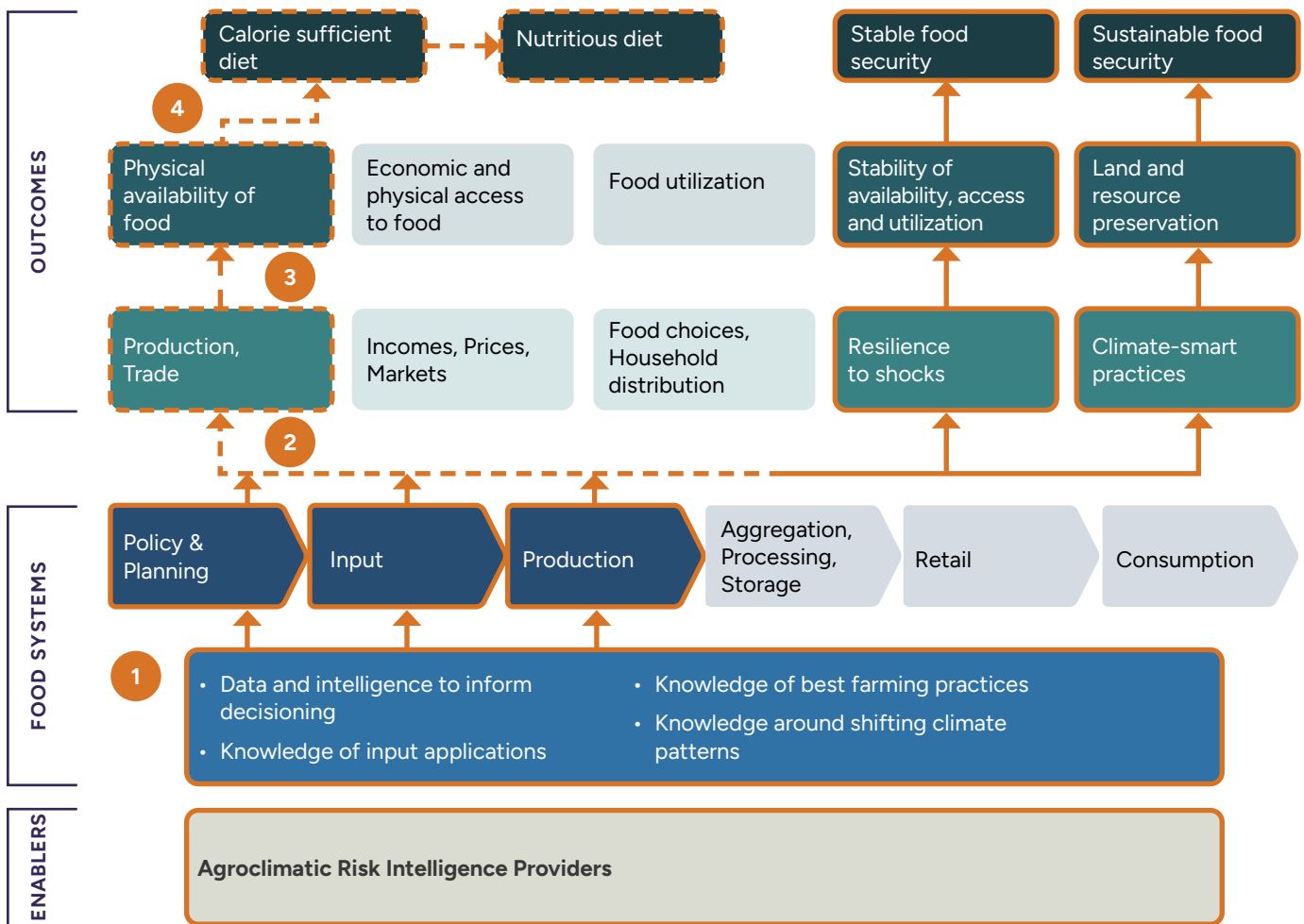
**Market Penetration:** HIGH – many solutions in LMICs

**Causal Chain Explanation**

1. Farm Management Services typically offer software solutions that provide the ability to digitize on-farm operations, in addition to farmer offerings including digital farmer records, agronomic knowledge, and sometimes access to finance and markets.
2. These B2B solutions often target agribusinesses – especially off-takers - at the production level.
3. Farm management services can boost production quantity and quality, while improving traceability through better farming practices and on-farm digitization. This increased production can lead to improvements in the physical availability of food and improved income for farmers. If knowledge and data provided focuses on resilience on climate-smart practices, these solutions could improve stability and land / resource preservation.
4. Through improved availability, consumers have improved access to calorie sufficient diets. Increased incomes could enable better purchasing power to be used for nutritious diets. Furthermore, improved agronomic knowledge can promote stable and sustainable food security if knowledge provided is relevant to resilience and climate practices.

Source: Authors.

FIGURE A7. **Agroclimatic Risk Intelligence Providers**



Legend Primary effect Secondary effect

**Overview**

**Definition:** Providers focused on analyzing agroclimatic data for informed decisioning, including agribusiness climate risk, regional agroclimatic risk analysis, market information, conservation, and carbon monitoring

**Target Clients:** B2B – FSPs; agribusinesses; multinationals

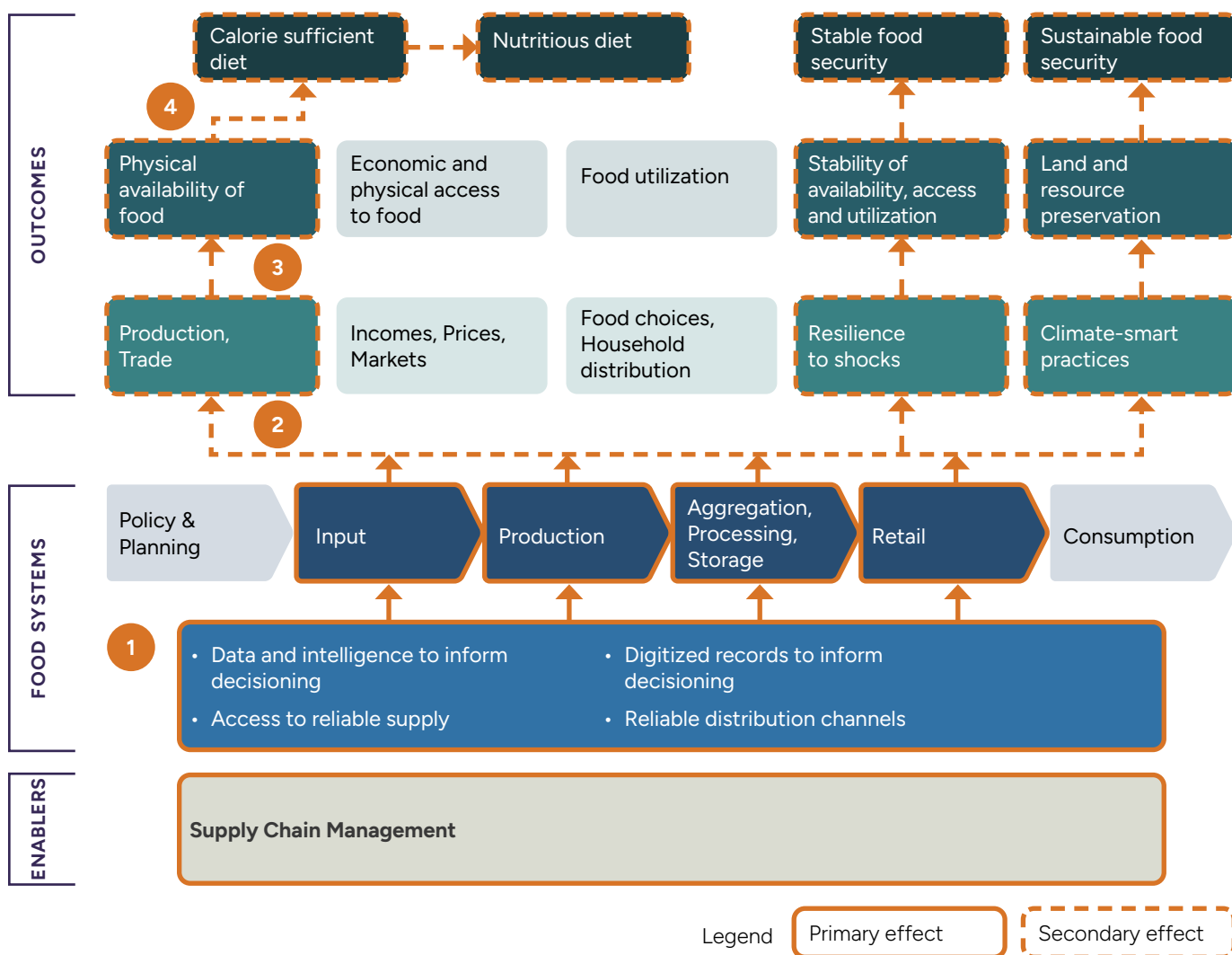
**Market Penetration:** LOW – limited number of solutions present in LMICs

**Causal Chain Explanation**

1. Agroclimatic risk intelligence providers leverage data and intelligence to help businesses and FSPs incorporate climate risk into decisioning in the agriculture sector.
2. These B2B solutions often target agribusinesses, multinationals, and FSPs throughout the planning and production phases.
3. Through the suite of solutions provided agroclimatic risk intelligence providers leverage data and intelligence to inform crop type and planting patterns, thereby enabling improved yields. This forecasting can help improve resilience to shocks and, through improved data and intelligence, promote adoption of climate-smart practices. This increased production, income and resilience can lead to improvements in the physical availability of food. Furthermore, improved production leads to improved food stability. In addition, macro intelligence that incorporates climate risk decisioning can improve sustainability.
4. Through increased availability and accessibility, consumers can have improved access to calorie sufficient diets and, in some cases, nutritious diets if enabled by greater purchasing power. Additionally, these solutions can lead to more stable and sustainable food security through improved stability and land / resource preservation.

Source: Authors.

FIGURE A8. **Supply Chain Management**



**Overview**

**Definition:** Supply chain digitization solutions allowing for tracking and tracing of food products, logistics optimization, or end-to-end value chain production planning and decisioning

**Target Clients:** B2B – agribusinesses

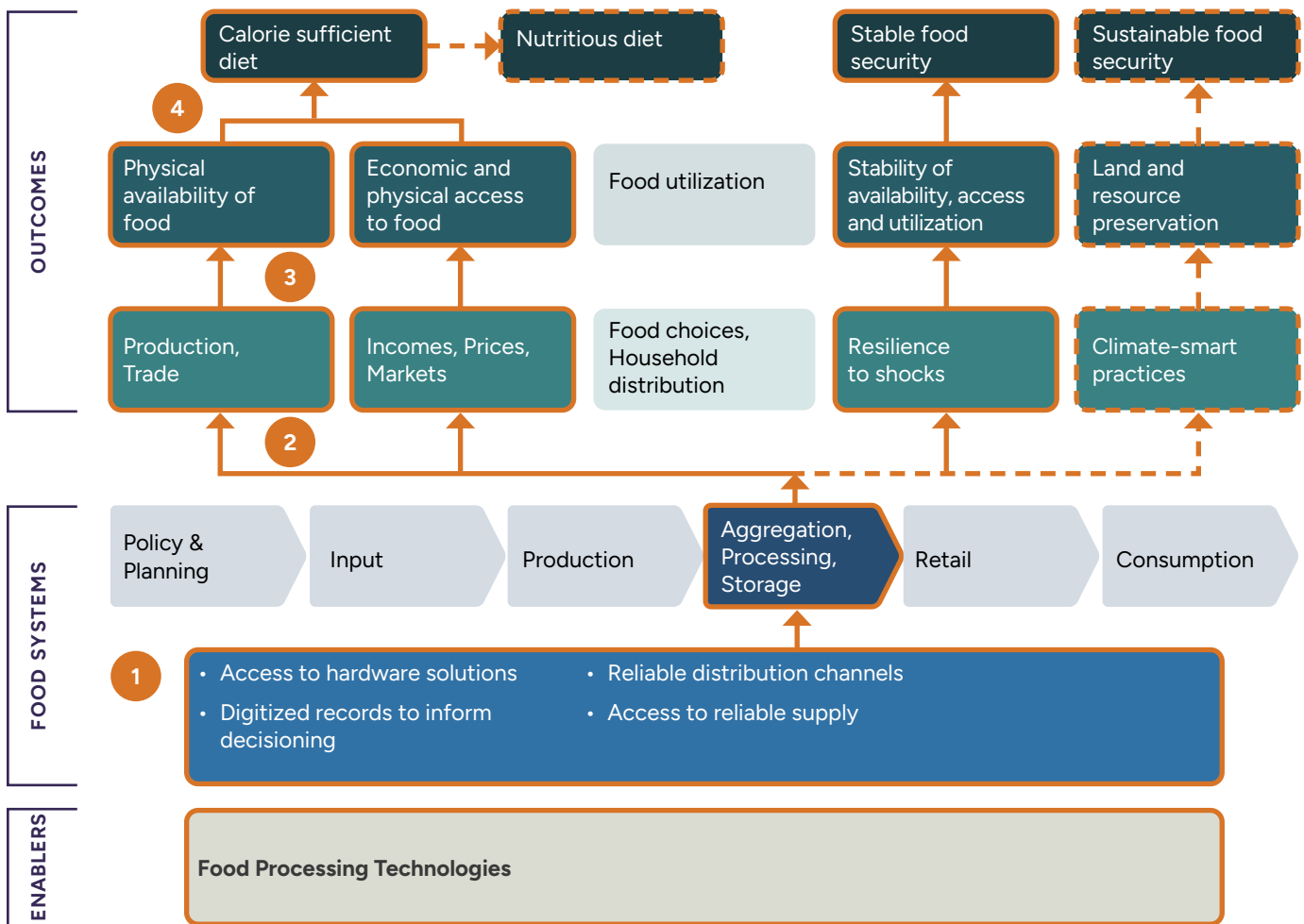
**Market Penetration:** MEDIUM – variety of solutions present in LMICs

**Causal Chain Explanation**

- Supply chain management solutions offer various software solutions including traceability, logistics optimization, and ERP services.
- These B2B solutions often target local, regional, and multinational agribusinesses at input, production, aggregation, and retail levels.
- Supply chain management solutions are intended to optimize logistics from farm to consumer. Through improved decisioning and digitization they can boost production at the farm-level. Furthermore, improved logistics can help decrease food loss along the supply chain. Additionally, if providing services that reduce supply chain emissions these solutions can improve land / resource preservation.
- If services lead to increased availability, stability and land / resource preservation, consumers have improved access to calorie sufficient diets, nutritious diets, stable and sustainable food security.

Source: Authors.

FIGURE A9. Food Processing Technologies



Legend Primary effect Secondary effect

**Overview**

**Definition:** Digitally enabled solutions to enhance efficiency and sustainability in food processing

**Target Clients:** B2B – agribusinesses

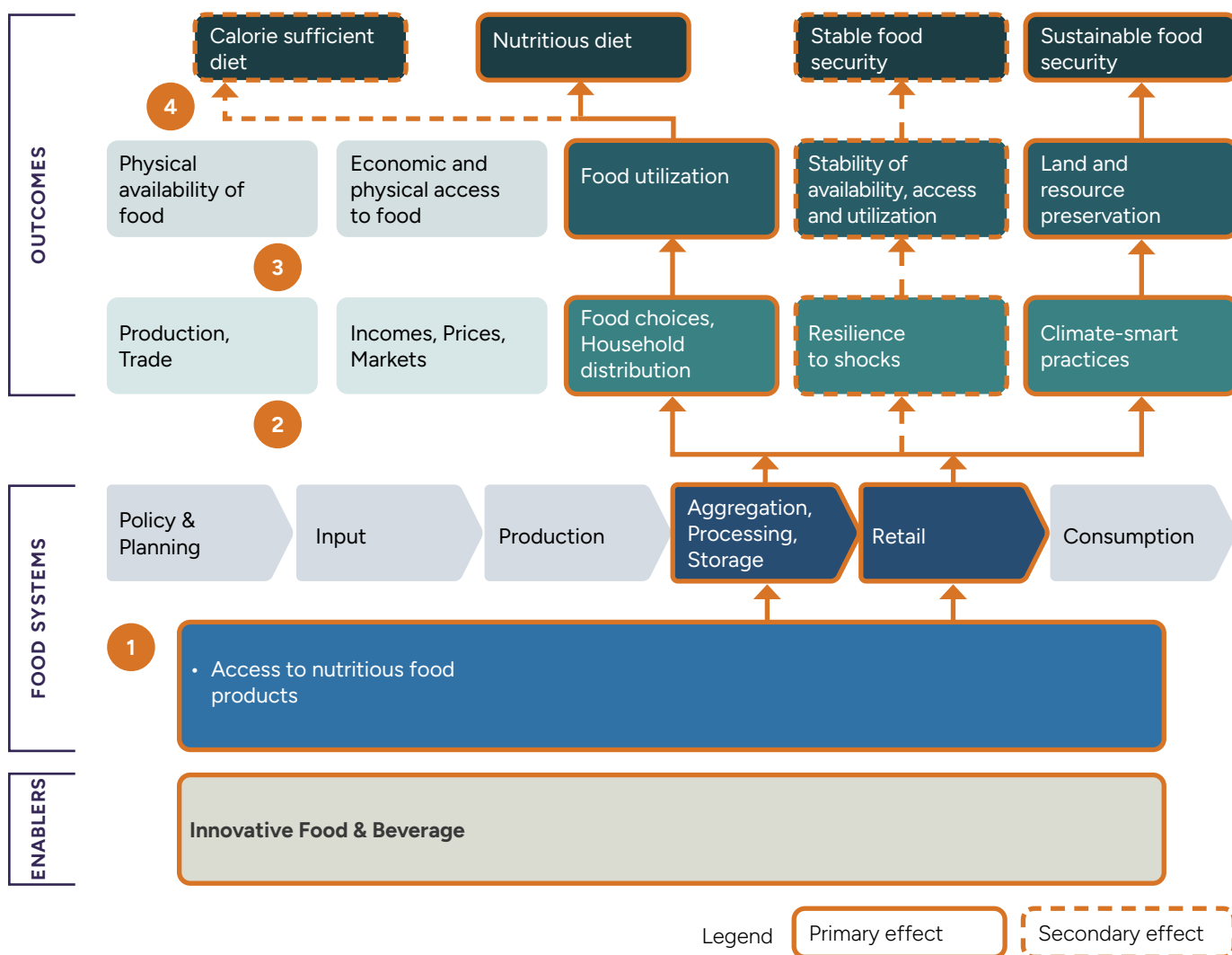
**Market Penetration:** MEDIUM – variety of solutions present in LMICs

**Causal Chain Explanation**

1. Innovative food processing technologies (for example, Tomato Jos) offer agro-processing services, often accompanied by digital software solutions that allows for improved tracking and traceability of food.
2. These B2B solutions often target agribusinesses at the aggregation, processing and storage level.
3. Through the suite of solutions provided, food processing technologies can boost the quantity of food reaching end consumers by increasing the effectiveness of processing and reducing food loss and waste along the supply chain. This increased productivity can lead to improvements in the physical availability and stability of food.
4. Through increased availability consumers have improved access to calorie sufficient diets and, if geared towards processing healthier produce, can lead to improved access to nutritious diets at lower costs. Furthermore, innovative technology providers promote stable food security through minimizing loss and sustainable food security if teaching farmers regenerative practices.

Source: Authors.

FIGURE A10. **Innovative Food and Beverage**



**Overview**

**Definition:** Solutions aimed at developing healthier and sustainable foods (i.e., cultured meat, novel ingredients, plant based proteins)

**Target Clients:** B2B2C & B2C – retailers; consumers

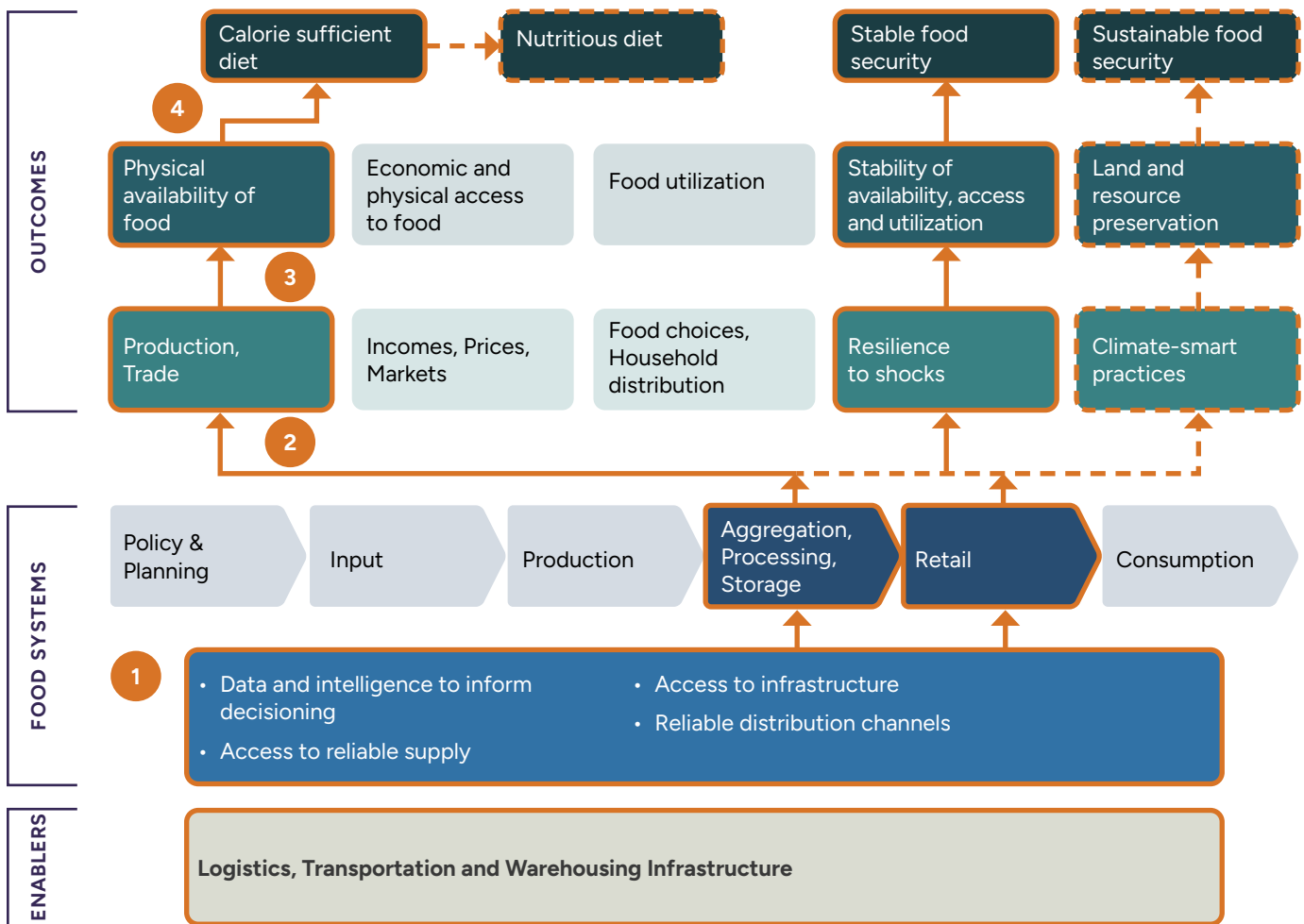
**Market Penetration:** LOW – limited number of solutions present in LMICs

**Causal Chain Explanation**

1. Innovative food and beverage companies (for example, Veggie Victory) provide alternative proteins, food additive solutions that preserve shelf life, and enriched food and beverages.
2. These B2B2C solutions are often produced in-house or added in the processing stage and often target consumers at the consumption level.
3. Through the suite of solutions provided, innovative food and beverage companies can boost the nutritional quality of food products reaching end consumers while providing different food choice options. This increased food optionality can lead to improvements in food utilization.
4. Through increased food options and healthier choices consumers have improved access to nutritious diets, along with improved stability and sustainability of food security, if food products are easy to produce and less harmful on the environment.

Source: Authors.

FIGURE A11. **Logistics, Transportation and Warehousing Infrastructure**



Legend Primary effect Secondary effect

**Overview**

**Definition:** Digitally enabled hardware and software solutions to optimize post-farm logistics

**Target Clients:** B2B and B2B2C – agribusinesses; retailers; farmers

**Market Penetration:** MEDIUM – variety of solutions present in LMICs

**Causal Chain Explanation**

1. Logistics, transportation and warehousing (for example, SokoFresh) offer hardware and software solutions to enable supply chain management, storage, processing and distribution.
2. These B2B and B2B2C solutions often target agribusinesses, retailers and farmers at production, aggregation, and retail levels.
3. Through the suite of solutions provided, logistics, transportation and warehousing solutions can boost the quantity of produce reaching end consumers by minimizing food loss and waste. Advanced transportation and storage solutions can move produce faster and store it longer which improves resilience to shocks. This increased production and resilience can lead to improvements in the physical availability of food and stability of food systems. If solutions are climate-smart (for example, solar cold-chain) they can also contribute to land / resource preservation.
4. Through increased availability and stability consumers have improved access to calorie sufficient diets and nutritious diets (minimizing perishable food loss), better stability and sustainability of food security.

Source: Authors.

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