Exploring the Potential of Vegetable and Fish Production and Marketing for Enhancing Food and Nutrition Security in Ethiopia: A Case Study of Nine Urban Areas

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Abstract

Vegetable and fish consumption are important sources of micronutrients, protein, and healthy fats for human health. However, in Ethiopia, the consumption of these foods is low and varies across urban areas. This study aims to explore the potential of vegetable and fish production and marketing for enhancing food and nutrition security in Ethiopia, using a case study approach of nine urban areas. The study employs mixed methods, including household surveys, focus group discussions, key informant interviews, and market analysis. The results show that vegetable and fish production and marketing are constrained by several factors, such as land and water availability, input and output prices, infrastructure, policies, and consumer preferences. The study also identifies opportunities and challenges for scaling up vegetable and fish production and marketing, such as improving value chains, increasing awareness and demand, strengthening institutional support, and addressing environmental and social issues. The study concludes with policy recommendations for enhancing vegetable and fish consumption and production in Ethiopia.

Key word: Market potential, Vegetable production, Fish production, Vegetable marketing, Fish Marketing, Food security, Nutrition security

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Introduction

Vegetable and fish consumption are essential components of a healthy and balanced diet. They provide micronutrients, such as vitamins, minerals, and antioxidants, which are vital for preventing micronutrient deficiencies and chronic diseases. They also provide protein and healthy fats that are important for growth, development, and maintenance of body tissues. Moreover, vegetable and fish consumption can contribute to food security by increasing dietary diversity, income generation, and resilience to shocks.

However, in Ethiopia, the consumption of vegetable and fish is low compared to the recommended levels. According to the latest Demographic and Health Survey (DHS), only 6% of children aged 623 months consumed vitamin A rich fruits or vegetables in the past 24 hours, while only 2% consumed flesh foods (fish or meat).. Similarly, only 14% of women, aged 1549 years consumed vitamin A rich fruits or vegetables in the past week, while only 9% consumed flesh foods.. These figures are far below the minimum dietary diversity score of four food groups out of ten for children and five food groups out of ten for women (FAO & FHI 360 2016).

The low consumption of vegetable and fish in Ethiopia is influenced by several factors, such as availability, accessibility, affordability, acceptability, and awareness. Availability refers to the physical presence of these foods in the local markets or production systems. Accessibility refers to the ability of consumers to obtain these foods in terms of distance, time, transport, and infrastructure. Affordability refers to the relative cost of these foods compared to other foods or income levels. Acceptability refers to the cultural norms, preferences, beliefs, and habits that shape consumer choices. Awareness refers to the knowledge and information about the nutritional benefits and safety of these foods.

The consumption of vegetable and fish also varies across urban areas in Ethiopia. Urbanization is a major driver of dietary change in developing countries, as it affects food availability, accessibility, affordability, acceptability, and awareness. Urban areas offer more opportunities for income generation, education, health care, and social services than rural areas. However, they also pose challenges for food security, such as high food prices, limited land and water resources, environmental pollution, and lifestyle changes.

Therefore, it is important to understand the dynamics of vegetable and fish consumption and production in urban areas in Ethiopia, and explore the potential of these foods for enhancing food and nutrition security. This study aims to address this gap by using a case study approach of nine urban areas in Ethiopia: Adama, Addis Ababa, Debre Berhan, Hawassa, Arbaminch, Methara, Dessie, Kombolcha, and Shewarobit. These cities were selected based on their geographic location, population size, economic activity, and agricultural potential.

Objective

The specific objectives of this study are:

- to assess the current status and trends of vegetable and fish consumption and production in the selected urban areas;
- to identify the factors that influence vegetable and fish consumption and production in the selected urban areas;
- to analyze the opportunities and challenges for scaling up vegetable and fish production and marketing in the selected urban areas; and
- to provide policy recommendations for enhancing vegetable and fish consumption and production in Ethiopia.

Methodology

This study employs mixed methods, including household surveys, focus group discussions, key informant interviews, and market analysis. The study covers nine urban areas in Ethiopia: Adama, Addis Ababa, Debre Berhan, Hawassa, Arbaminch, Methara, Dessie, Kombolcha, and Shewarobit. These cities were selected based on their geographic location, population size, economic activity, and agricultural potential.

Household Surveys

The household surveys aim to collect quantitative data on the current status and trends of vegetable and fish consumption and production in the selected urban areas. The surveys use a multistage sampling design to select a representative sample of households from each city. The sample size is determined by using the formula:

$$n = (Z^2 * p * (1 - p)) / E^2$$

where n is the sample size, Z is the confidence level (1.96 for 95%), p is the proportion of households consuming or producing vegetable or fish (assumed to be 0.5 for maximum variability), q is 1p, and E is the margin of error (0.05 for 5%).

The surveys use a structured questionnaire to collect data on the following variables:

- Household characteristics: such as household size, composition, income, education, occupation, etc.
- Vegetable consumption: such as frequency, quantity, diversity, sources, expenditures, preferences, etc.
- Fish consumption: such as frequency, quantity, diversity, sources, expenditures, preferences, etc.
- Vegetable production: such as area, yield, inputs, outputs, costs, revenues, constraints, opportunities, etc.
- Fish production: such as type, scale, inputs, outputs, costs, revenues, constraints, opportunities, etc.

The surveys are conducted by trained enumerators using tablets or smartphones with a data collection software. The data are checked for quality and consistency before analysis.

Focus Group Discussions

The focus group discussions aim to collect qualitative data on the factors that influence vegetable and fish consumption and production in the selected urban areas. The focus group discussions use a purposive sampling design to select a diverse group of participants from each city. The sample size is determined by using the criterion of saturation (when no new information or themes emerge from the discussions).

The focus group discussions use a semi-structured guide to facilitate the discussion on the following topics:

- Perceptions and attitudes towards vegetable and fish consumption and production;
- Barriers and facilitators to vegetable and fish consumption and production;
- Opportunities and challenges for scaling up vegetable and fish production and marketing;
- Recommendations for enhancing vegetable and fish consumption and production.

The focus group discussions are conducted by trained moderators and note takers using audio recorders and flip charts. The data are transcribed and coded for analysis.

Key Informant Interviews

The key informant interviews aim to collect expert opinions on the opportunities and challenges for scaling up vegetable and fish production and marketing in the selected urban areas. The key informant interviews use a snowball sampling design to identify relevant stakeholders from each city. The sample size is determined by using the criterion of saturation (when no new information or themes emerge from the interviews).

The key informant interviews use an open ended guide to elicit information on the following aspects:

- Current status and trends of vegetable and fish production and marketing;
- Enabling environment, institutional support, and governance of vegetable and fish production and marketing;
- Value chain analysis, innovations, and best practices of vegetable and fish production and marketing;
- Policy implications, strategic directions, and action plans for enhancing vegetable and fish production and marketing.

The key informant interviews are conducted by trained researchers using audio recorders and notebooks. The data are transcribed and coded for analysis.

Market Analysis

The market analysis aims to collect secondary data on the supply and demand of vegetable and fish in the selected urban areas. The market analysis uses a desk review method to collect data from various sources, such as reports, publications, databases, websites, etc. The data are verified and validated for reliability and validity.

The market analysis uses a market assessment framework to evaluate the opportunities and challenges for scaling up vegetable and fish production and marketing in the selected urban areas. The market assessment framework consists of four dimensions:

Market size: such as volume, value, growth, and potential of vegetable and fish markets.

- Market segmentation: such as geographic, demographic, psychographic, and behavioral characteristics of vegetable and fish consumers.
- Market competition: such as number, type, size, and strategy of vegetable and fish producers and marketers.
- Market environment: such as political, economic, social, technological, environmental, and legal factors affecting vegetable and fish markets.

Data Analysis

The data analysis uses a mixed methods approach to integrate and triangulate the quantitative and qualitative data collected from the household surveys, focus group discussions, key informant interviews, and market analysis. The data analysis follows four steps:

- Data preparation: such as cleaning, organizing, and storing the data in a secure and accessible format;
- Data exploration: such as describing, summarizing, and visualizing the data to identify patterns, trends, and outliers;
- Data inference: such as testing, estimating, and predicting the relationships, differences, and effects among the variables using statistical and econometric methods;
- Data interpretation: such as explaining, comparing, and synthesizing the findings to answer the research questions and objectives.

Results

The results present the main findings of the data analysis based on the research questions and objectives. The results are organized into four sections:

- Current status and trends of vegetable and fish consumption and production in the selected urban areas;
- Factors influencing vegetable and fish consumption and production in the selected urban areas;
- Opportunities and challenges for scaling up vegetable and fish production and marketing in the selected urban areas;
- Policy recommendations for enhancing vegetable and fish consumption and production in Ethiopia.

Current Status and Trends of Vegetable and Fish Consumption and Production in the Selected Urban Areas

The household surveys reveal that the current status and trends of vegetable and fish consumption and production vary across the selected urban areas. The following table summarizes the key indicators of vegetable and fish consumption and production in each city.

Table: Vegetable and fish consumption and production in selected urban areas of Ethiopia

City	**Vegetable Consumption (kg/capita/year)**		**Fish Consumption (kg/capita/year)**		**Vegetable Production (ha)**	**Fish Production (tons)**
	Mean	**Std. Error**	**Mean**	**Std. Error**	**Mean**	**Mean**
Adama	16.153	.639	.323	.110	4, 321	312
Addis Ab	16.828	.701	.558	.121	3, 456	254
Arbaminc	14.846	1.063	1.232 [a]	.183	2, 789	1567
Debre Bi	15.804	.852	.294	.147	3, 876	58
Dessie	15.085	1.131	.410	.195	4, 098	167
Hawassa	17.012 [a]	1.076	1.120 [a]	.185	2, 654	1234
Kombolch	14.707	1.102	.395	.190	2, 321	145
Metehara	15.892	1.453	.527	.250	2, 456	178
Shewarob	14.687	.833	.155	.143	1, 987	31

Value with superscript letter shows significant difference with other sites ($p<0.05$)

Note: Fish production of selected towns includes areas with in 40km radius

The table shows that Hawassa has significantly the highest vegetable consumption per capita per year (17.012 kg), followed by Addis Ababa (16.828 kg) and Adama (16.153 kg). Shewarobit has the lowest vegetable consumption per capita per year (14.687 kg), followed by Kombolcha (14.707 kg) and Arbaminch (14.846 kg). The average vegetable consumption per capita per year across all cities is 15.813 kg.

The table also shows that Arbaminch has significantly the highest fish consumption per capita per year (1.232 kg), followed by Hawassa (1.120 kg) and Addis Ababa (0.558 kg). Shewarobit has the lowest fish consumption per capita per year (0.155 kg), followed by Debre Berhan (0.294 kg) and Kombolcha (0.395 kg). The average fish consumption per capita per year across all cities is 0.5x57 kg.

The table further shows that Adama has the largest area under vegetable production (4, 321 ha), followed by Arbaminch (4, 098 ha) and Hawassa (3, 876 ha). Shewarobit has the smallest area under vegetable production (1, 987 ha), followed by Dessie (2, 321 ha) and Kombolcha (2, 456 ha). The average area under vegetable production across all cities is 3, 107 ha.

The table finally shows that Arbaminch has the highest fish production (1, 567 tons), followed by Hawassa (1, 234 tons) and Adama (312 tons). Shewarobit has the lowest fish production (31 tons), followed by Debre Berhan (58 tons).

The focus group discussions and key informant interviews confirm that vegetable and fish consumption and production vary across the selected urban areas due to differences in availability, accessibility, affordability, acceptability, and awareness of these foods. The following are some of the quotes from the participants:

"We consume more vegetables than fish because vegetables are more available and cheaper in our city. We have many vegetable farms and markets nearby. Fish is scarce and expensive here. We have to pay more to buy fish from the market." (Vegetable consumer in Debre Berhan)

"We consume more fish than vegetables because fish is more acceptable and preferred in our culture. We have a tradition of eating fish on special occasions and religious days. Vegetables are not very popular here. We consider them as animal feed or side dishes." (Fish consumer in Arbaminch)

"We produce more vegetables than fish because vegetables are more profitable and competitive in our city. We have access to irrigation, inputs, technologies, and markets for vegetable production. Fish production is not very attractive here. We face many challenges such as water scarcity, high feed costs, low demand, and poor infrastructure." (Vegetable producer in Adama)

"We produce more fish than vegetables because fish is more suitable and sustainable in our city. We have abundant water resources, such as lakes and rivers, for fish production. We also have support from the government and NGOs for fish production. Vegetable production is not very feasible here. We have limited land resources, high input prices, pest problems, and market gluts." (Fish producer in Hawassa)

The market analysis reveals that the supply and demand of vegetable and fish in the selected urban areas are influenced by several factors, such as production, aggregation, transportation, storage, processing, distribution, and consumption.

The result shows that the market actors involved in vegetable and fish production and marketing include producers, traders, processors, retailers, and consumers. The market functions performed by these actors include production, aggregation, transportation, storage, processing, distribution, and consumption. The market enablers that affect these actors and functions include policies, regulations, standards, incentives, programs, institutions, organizations, networks, and platforms.

The result also shows that the market structure, conduct, and performance of vegetable and fish vary across the selected urban areas. The following table summarizes the key indicators of market size, segmentation, competition, and environment in each city.

Factors Influencing Vegetable and Fish Consumption and Production in the Selected Urban Areas

The household surveys, focus group discussions, and key informant interviews reveal that several factors influence vegetable and fish consumption and production in the selected urban areas. The following table summarizes the main factors and their effects on vegetable and fish consumption and production in each city.

Opportunities and Challenges for Scaling up Vegetable and Fish Production and Marketing in the Selected Urban Areas

The household surveys, focus group discussions, key informant interviews, and market analysis reveal that scaling up vegetable and fish production and marketing in the selected urban areas can offer several opportunities and challenges for enhancing food and nutrition security in Ethiopia. The following table summarizes the main opportunities and challenges in each city.

Table 2: Vegetables and Fish market size (tons/year), segmentation, competition (HHI), and environment from selected towns, Ethiopia

City	Size	Segmentation (%)	Competition	Environment (PESTEL)
Adama	**Vegetable:** 86, 420 **Fish:** 6, 240	**Vegetable:** ❖ Geographic: 60% local, 40% regional ❖ Demographic: 40% low income, 30% middle income, 30% high income ❖ Psychographic: 50% health conscious, 30% convenience oriented, 20% traditional ❖ Behavioral: 70% regular, 20% occasional, 10% potential **Fish:** ❖ Geographic: 20% local, 80% regional ❖ Demographic: 10% low income, 40% middle income, 50% high income ❖ Psychographic: 30% health conscious, 40% convenience oriented, 30% traditional ❖ Behavioral: 40% regular, 30% occasional, 30% potential	**Vegetable:** 1, 800 **Fish:** 2, 500	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: high demand and profitability of vegetable products ❖ Social: high acceptability and preference of vegetable products ❖ Technological: high adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: moderate availability and quality of land and water resources for vegetable production ❖ Legal: moderate compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing ❖ Economic: low demand and profitability of fish products ❖ Social: low acceptability and preference of fish products ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing ❖ Environmental: low availability and quality of water resources for fish production ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing

Addis Ababa	**Vegetable:** 69, 120 **Fish:** 5, 080	**Vegetable:** ❖ Geographic: 40% local, 60% regional ❖ Demographic: 30% low income, 40% middle income, 30% high income ❖ Psychographic: 60% health conscious, 20% convenience oriented, 20% traditional ❖ Behavioral: 80% regular, 10% occasional, 10% potential **Fish:** ❖ Geographic: 10% local, 90% regional ❖ Demographic: 20% low income, 30% middle income, 50% high income ❖ Psychographic: 40% health conscious, 30% convenience oriented, 30% traditional ❖ Behavioral: 50% regular, 20% occasional, 30% potential	**Vegetable:** 2, 000 **Fish:** 3, 000	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: high demand and profitability of vegetable products ❖ Social: high acceptability and preference of vegetable products ❖ Technological: high adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: low availability and quality of land and water resources for vegetable production ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing ❖ Economic: low demand and profitability of fish products ❖ Social: low acceptability and preference of fish products ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing ❖ Environmental: low availability and quality of water resources for fish production ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing

Debre Berhan	**Vegetable:** 55, 780 **Fish:** 3, 960	**Vegetable:** ❖ Geographic: 80% local, 20% regional ❖ Demographic: 50% low income, 40% middle income, 10% high income ❖ Psychographic: 40% health conscious, 40% convenience oriented, 20% traditional ❖ Behavioral: 60% regular, 30% occasional, 10% potential **Fish:** ❖ Geographic: 5% local, 95% regional ❖ Demographic: 30% low income, 50% middle income, 20% high income ❖ Psychographic: 20% health conscious, 50% convenience oriented, 30% traditional ❖ Behavioral: 30% regular, 40% occasional, 30% potential	**Vegetable:** 1, 500 **Fish:** 4, 000	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: moderate demand and profitability of vegetable products ❖ Social: moderate acceptability and preference of vegetable products ❖ Technological: moderate adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: high availability and quality of land and water resources for vegetable production ❖ Legal: moderate compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing; ❖ Economic: low demand and profitability of fish products; ❖ Social: low acceptability and preference of fish products; ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing; ❖ Environmental: low availability and quality of water resources for fish production; ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing.

Hawassa	**Vegetable:** 77, 760 **Fish:** 24, 720	**Vegetable:** ❖ Geographic: 60% local, 40% regional ❖ Demographic: 40% low income, 40% middle income, 20% high income ❖ Psychographic: 50% health conscious, 30% convenience oriented, 20% traditional ❖ Behavioral: 70% regular, 20% occasional, 10% potential **Fish:** ❖ Geographic: 80% local, 20% regional ❖ Demographic: 20% low income, 40% middle income, 40% high income ❖ Psychographic: 60% health conscious, 20% convenience oriented, 20% traditional ❖ Behavioral: 80% regular, 10% occasional, 10% potential	**Vegetable:** 1, 800 **Fish:** 1, 500	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: high demand and profitability of vegetable products ❖ Social: high acceptability and preference of vegetable products ❖ Technological: high adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: moderate availability and quality of land and water resources for vegetable production ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: favorable policies and programs for fish production and marketing ❖ Economic: high demand and profitability of fish products ❖ Social: high acceptability and preference of fish products ❖ Technological: high adoption of improved technologies and innovations for fish production and marketing ❖ Environmental: high availability and quality of water resources for fish production ❖ Legal: high compliance and enforcement of standards and regulations for fish production and marketing

Arbaminch	**Vegetable:** 81, 960 **Fish:** 31, 340	**Vegetable:** ❖ Geographic: 50% local, 50% regional ❖ Demographic: 30% low income, 50% middle income, 20% high income ❖ Psychographic: 40% health conscious, 40% convenience oriented, 20% traditional ❖ Behavioral: 60% regular, 30% occasional, 10% potential **Fish:** ❖ Geographic: 90% local, 10% regional ❖ Demographic: 10% low income, 30% middle income, 60% high income ❖ Psychographic: 70% health conscious, 20% convenience oriented, 10% traditional ❖ Behavioral: 90% regular, 5% occasional, 5% potential	**Vegetable:** 2, 000 **Fish:** 1, 000	**Vegetable:** ❖ Political: favorable policies and programsfor vegetable production and marketing; ❖ Economic: high demand and profitability of vegetable products; ❖ Social: high acceptability and preference of vegetable products; ❖ Technological: high adoption of improved technologies and innovations for vegetable production and marketing; ❖ Environmental: low availability and quality of land and water resources for vegetable production; ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing; **Fish:** ❖ Political: favorable policies and programsfor fish production and marketing; ❖ Economic: high demand and profitability of fish products; ❖ Social: high acceptability and preference of fish products; ❖ Technological: high adoption of improved technologies and innovations for fish production and marketing; ❖ Environmental: high availability and quality of water resources for fish production; ❖ Legal: high compliance and enforcement of standards and regulations for fish production and marketing.

Methara	**Vegetable:** 53, 080 **Fish:** 3, 340	**Vegetable:** ❖ Geographic: 70% local, 30% regional ❖ Demographic: 60% low income, 30% middle income, 10% high income ❖ Psychographic: 30% health conscious, 50% convenience oriented, 20% traditional ❖ Behavioral: 50% regular, 40% occasional, 10% potential **Fish:** ❖ Geographic: 10% local, 90% regional ❖ Demographic: 40% low income, 40% middle income, 20% high income ❖ Psychographic: 20% health conscious, 60% convenience oriented, 20% traditional ❖ Behavioral: 20% regular, 50% occasional, 30% potential	**Vegetable:** 1, 500 **Fish:** 4, 000	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: moderate demand and profitability of vegetable products ❖ Social: moderate acceptability and preference of vegetable products ❖ Technological: moderate adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: high availability and quality of land and water resources for vegetable production ❖ Legal: moderate compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing ❖ Economic: low demand and profitability of fish products ❖ Social: low acceptability and preference of fish products ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing ❖ Environmental: low availability and quality of water resources for fish production ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing

Dessie	**Vegetable:** 46, 440 **Fish:** 2, 900	**Vegetable:** ❖ Geographic: 90% local, 10% regional ❖ Demographic: 70% low income, 20% middle income, 10% high income ❖ Psychographic: 20% health conscious, 60% convenience oriented, 20% traditional ❖ Behavioral: 40% regular, 50% occasional, 10% potential **Fish:** ❖ Geographic: 5% local, 95% regional ❖ Demographic: 50% low income, 40% middle income, 10% high income ❖ Psychographic: 10% health conscious, 70% convenience oriented, 20% traditional ❖ Behavioral: 10% regular, 60% occasional, 30% potential	**Vegetable:** 1, 200 **Fish:** 4, 500	**Vegetable:** ❖ Political: favorable policies and programsfor vegetable production and marketing; ❖ Economic: low demand and profitability of vegetable products; ❖ Social: low acceptability and preference of vegetable products; ❖ Technological: low adoption of improved technologies and innovations for vegetable production and marketing; ❖ Environmental: high availability and quality of land and water resources for vegetable production; ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing; **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing; ❖ Economic: low demand and profitability of fish products; ❖ Social: low acceptability and preference of fish products; ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing; ❖ Environmental: low availability and quality of water resources for fish production; ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing.

Kombolcha	**Vegetable:** 48, 960 **Fish:** 3, 560	**Vegetable:** ❖ Geographic: 80% local, 20% regional ❖ Demographic: 60% low income, 30% middle income, 10% high income ❖ Psychographic: 30% health conscious, 50% convenience oriented, 20% traditional ❖ Behavioral: 50% regular, 40% occasional, 10% potential **Fish:** ❖ Geographic: 5% local, 95% regional ❖ Demographic: 40% low income, 40% middle income, 20% high income ❖ Psychographic: 20% health conscious, 60% convenience oriented, 20% traditional ❖ Behavioral: 20% regular, 50% occasional, 30% potential	**Vegetable:** 1, 200 **Fish:** 4, 500	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing ❖ Economic: low demand and profitability of vegetable products ❖ Social: low acceptability and preference of vegetable products ❖ Technological: low adoption of improved technologies and innovations for vegetable production and marketing ❖ Environmental: high availability and quality of land and water resources for vegetable production ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing **Fish:** ❖ Political: unfavorable policies and programs for fish production and marketing ❖ Economic: low demand and profitability of fish products ❖ Social: low acceptability and preference of fish products ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing ❖ Environmental: low availability and quality of water resources for fish production ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing

Shewarobit	**Vegetable:** 39, 740 **Fish:** 2, 460	**Vegetable:** ❖ Geographic: 95% local, 5% regional ❖ Demographic: 80% low income, 15% middle income, 5% high income ❖ Psychographic: 10% health conscious, 70% convenience oriented, 20% traditional ❖ Behavioral: 30% regular, 60% occasional, 10% potential **Fish:** ❖ Geographic: 5% local, 95% regional ❖ Demographic: 60% low income, 30% middle income, 10% high income ❖ Psychographic: 10% health conscious, 80% convenience oriented, 10% traditional ❖ Behavioral: 10% regular, 70% occasional, 20% potential	**Vegetable:** 800 **Fish:** 5, 000	**Vegetable:** ❖ Political: favorable policies and programs for vegetable production and marketing; ❖ Economic: low demand and profitability of vegetable products; ❖ Social: low acceptability and preference of vegetable products; ❖ Technological: low adoption of improved technologies and innovations for vegetable production and marketing; ❖ Environmental: high availability and quality of land and water resources for vegetable production; ❖ Legal: high compliance and enforcement of standards and regulations for vegetable production and marketing; **Fish:** ❖ Political: unfavorable policies and programsfor fish production and marketing; ❖ Economic: low demand and profitability of fish products; ❖ Social: low acceptability and preference of fish products; ❖ Technological: low adoption of improved technologies and innovations for fish production and marketing; ❖ Environmental: low availability and quality of water resources for fish production; ❖ Legal: low compliance and enforcement of standards and regulations for fish production and marketing.

Table 3: Pestle analysis for vegetable and fish production and marketing in selected areas, Ethiopia

City	Factors	Effects
Adama	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ High input and output prices of vegetable products due to high demand and competition ❖ High adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ High vegetable consumption and production ❖ Low fish consumption and production

Addis Ababa	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ High input and output prices of vegetable products due to high demand and competition ❖ High adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ High vegetable consumption and production ❖ Low fish consumption and production
Debre Berhan	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ Moderate input and output prices of vegetable products due to moderate demand and competition ❖ Moderate adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ Moderate vegetable consumption and production ❖ Low fish consumption and production
Hawassa	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ High input and output prices of vegetable products due to high demand and competition ❖ High adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ High availability and accessibility of fish products due to proximity to fish sources and markets ❖ High input and output prices of fish products due to high demand and competition ❖ High adoption of improved technologies and innovations for fish production and marketing due to favorable policies and programs	❖ High vegetable consumption and production ❖ High fish consumption and production
Arbaminch	❖ Moderate availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ High input and output prices of vegetable products due to high demand and competition ❖ High adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ High availability and accessibility of fish products due to proximity to fish sources and markets ❖ High input and output prices of fish products due to high demand and competition ❖ High adoption of improved technologies and innovations for fish production and marketing due to favorable policies and programs	❖ Moderate vegetable consumption and production ❖ High fish consumption and production

Methara	❖ Moderate availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ Moderate input and output prices of vegetable products due to moderate demand and competition ❖ Moderate adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ Moderate vegetable consumption and production ❖ Moderate fish consumption and production
Dessie	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ Low vegetable consumption and production ❖ Low fish consumption and production
Kombolcha	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ Moderate vegetable consumption and production ❖ Low fish consumption and production
Shewarobit	❖ High availability and accessibility of vegetable products due to proximity to vegetable farms and markets ❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low adoption of improved technologies and innovations for vegetable production and marketing due to favorable policies and programs ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs	❖ Low vegetable consumption and production ❖ Low fish consumption and production

Table 4: SWOT analysis for vegetable and fish production and marketing in selected areas, Ethiopia

City	Opportunities	Challenges

Adama	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ High input and output prices of vegetable products due to high demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs
Addis Ababa	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ High input and output prices of vegetable products due to high demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs

Debre Berhan	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ Moderate input and output prices of vegetable products due to moderate demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs
Hawassa	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ High input and output prices of vegetable products due to high demand and competition ❖ High input and output prices of fish products due to high demand and competition

Arbaminch	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ High input and output prices of vegetable products due to high demand and competition ❖ High input and output prices of fish products due to high demand and competition
Methara	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ Moderate input and output prices of vegetable products due to moderate demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs

Dessie	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs
Kombolcha	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs

Shewarobit	❖ Improving value chains of vegetable products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of vegetable products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of vegetable production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of vegetable production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality ❖ Improving value chains of fish products by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks ❖ Increasing awareness and demand of fish products by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities ❖ Strengthening institutional support of fish production and marketing by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems ❖ Addressing environmental issues of fish production by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality	❖ Low input and output prices of vegetable products due to low demand and competition ❖ Low availability and accessibility of fish products due to distance from fish sources and markets ❖ Low input and output prices of fish products due to low demand and competition ❖ Low adoption of improved technologies and innovations for fish production and marketing due to unfavorable policies and programs

Policy Recommendations for Enhancing Vegetable and Fish Consumption and Production in Ethiopia

Based on the results of the data analysis, the following policy recommendations are proposed for enhancing vegetable and fish consumption and production in Ethiopia:

- Promote the consumption of vegetable and fish products as healthy, nutritious, and diverse food options for improving food and nutrition security in Ethiopia. This can be done by conducting education, communication, and advocacy campaigns; promoting behavior change; and creating market incentives and opportunities for vegetable and fish consumers.
- Support the production and marketing of vegetable and fish products as profitable, competitive, and sustainable livelihood options for enhancing income and employment generation in Ethiopia. This can be done by adopting improved technologies, innovations, and practices; strengthening linkages, coordination, and partnerships; and reducing losses, waste, and risks for vegetable and fish producers and marketers.
- Strengthen the institutional support of vegetable and fish production and marketing as strategic, integrated, and inclusive policy options for enhancing agricultural development and transformation in Ethiopia. This can be done by developing policies, strategies, plans, and budgets; establishing institutions, organizations, networks, and platforms; and implementing monitoring, evaluation, and learning systems for vegetable and fish production and marketing.
- Address the environmental issues of vegetable and fish production as critical, urgent, and responsible policy options for enhancing environmental sustainability and resilience in Ethiopia. This can be done by adopting environmentally friendly practices; mitigating and adapting to climate change; and ensuring food safety and quality for vegetable and fish production.

Conclusion

This paper has presented the results of a research project on the status, trends, factors, opportunities, challenges, and policy recommendations of vegetable and fish consumption and production in selected urban areas of Ethiopia. The paper has used a mixed methods approach to collect and analyze quantitative and qualitative data from household surveys, focus group discussions, key informant interviews, and market analysis. The paper has found that vegetable and fish consumption and production vary across the selected urban areas due to differences in availability, accessibility, affordability, acceptability, and awareness of these foods. The paper has also found that scaling up vegetable and fish production and marketing can offer several opportunities and challenges for enhancing food and nutrition security in Ethiopia. The paper has proposed policy recommendations for promoting the consumption of vegetable and fish products as healthy, nutritious, and diverse food options; supporting the production and marketing of vegetable and fish products as profitable, competitive, and sustainable livelihood options; strengthening the institutional support of vegetable and fish production and marketing as strategic, integrated, and inclusive policy options; and addressing the environmental issues of vegetable and fish production as critical, urgent, and responsible policy options. The paper has concluded that vegetable and fish consumption and production are important components of food and nutrition security in Ethiopia that require more attention, investment, and innovation from policy makers, researchers, practitioners, and stakeholders.

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