WATER FOOTPRINT CALCULATOR

SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE

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2024-2025

DECLARATION

We hereby declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person or material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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CERTIFICATE

This is to certify that Project Report entitled "**Water Footprint Calculator**" which is submitted by **Shivanshu Srivastava, Shikha Kushwaha, Sumit Tiwari and Suraj Jain** in partial fulfilment of the requirement for the award of degree B.Tech. in Department of Computer Science of Dr A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

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ACKNOWLEDGEMENT

It gives us a great sense of pleasure to present the synopsis of the B.Tech. Major Project undertaken during B.Tech. Third Year. We owe a special debt of gratitude to Prof. Vivek Kumar Sharma, Department of Computer Science, KIET Group of Institutions, Delhi-NCR, Ghaziabad, for his constant support and guidance throughout the course of our work. His sincerity, thoroughness and perseverance have been a constant source of inspiration for us. It is only his cognizant efforts that our endeavors have seen the light of the day.

We also take the opportunity to acknowledge the contribution of Dr. Ajay Kumar Srivastav sir, Head of the Department of Computer Science, KIET Group of Institutions, Delhi- NCR, Ghaziabad, for his full support and assistance during the development of the project. We also do not like to miss the opportunity to acknowledge the contribution of all the faculty members of the department for their kind assistance and cooperation during the development of our project. Last but not the least, we acknowledge our friends for their contribution to the completion of the project.

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ABSTRACT

Water footprint denotes the total amount of freshwater required to produce goods and services we use. Water footprint helps in better analysis of freshwater resource utilization and consumption. It shows from where water is taken from and from where it comes. It analysis if the water is scarce, consequences are significant or not. The increase in the water consumption has led to water pollution and scarce groundwater. Increased Water footprints of products has led to water scarce situation.

Avoiding severe drought situation is very important and is possible when water resources are better utilized, this can be done in reducing water footprints of products. We can use advance technologies like AI, Big data, Blockchain etc to analysis data and better utilization. A user friendly website or app is developed which provides us the water footprint of different goods we use in our day to day daily life by giving little inputs about goods. This app must support local language to ensure PAN – India usage and aware the people about the water footprints items.

Alignment with UN Sustainable Development Goals (SDGs)

SDG 6: Clean Water and Sanitation

The project implements actions directly in line with Target 6.4 that focuses on boosting water-use efficiency together with secure freshwater extraction.
Water measurement enables us to find excessive use then develop conservation plans.

SDG 12: Responsible Consumption and Production

The program helps achieve Target 12.2 whose focus is sustainable management and efficient resource utilization.
The initiative promotes industries and persons to follow responsible water consumption behaviors.

SDG 13: Climate Action

Anyone trying to achieve Target 13.1 will find assistance through the project as it helps enhance climate resilience against water-related stress and droughts.
The project delivers climate change data needed to support policy development for addressing water scarcity caused by climate change.

SDG 9: Industry, Innovation, and Infrastructure

The requirement for examining water footprints drives technological innovating efforts which result in sustainable industrial methods.

SDG 15: Life on Land

The sustainable implementation of water resources supports freshwater ecosystem protection according to Goal 15.1 through responsible water management and decreased pollution.

LIST OF FIGURES

CHAPTER
INTRODUCTION

1.1 INTRODUCTION

Comprehending the management of water footprints stands as a vital problem statement because these footprints measure the water used for product and service development. The increase of water scarcity as well as pollution requires understanding these footprints for sustainable water management to become effective. Water-stressed areas experience exceptional consequences from this situation which necessitates an immediate solution. Acceptable insights regarding water footprints become accessible through a user- friendly application or website via digital tools including AI, Big Data, and Blockchain technologies. Users gain power through this solution to understand their choices better while learning sustainable H2O usage habits. The intended solution works to minimize adverse H2O footprint growth while promoting wise freshwater management through awareness programs and proactive actions to achieve sustainability for future generations.

Figure 1.1 Process of Jeans

Total consumption of water =
WCP+WFP+WGM+WTD+WCC

EXAMPLE OF WATER FOOTPRINT

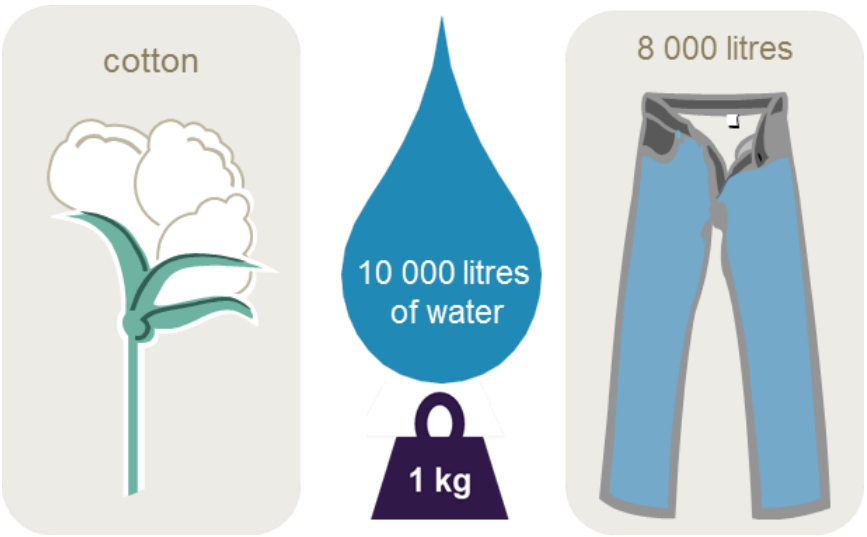


Figure 1.2 Jeans's Water FootPrints

1.2 OBJECTIVES

1. **Increase Awareness:** An educational program should teach users about water usage during production along with helping them comprehend their water-related habits and how these affect the environment.

2. **Empower Informed Choices:** Users can make knowledgeable choices by receiving full transparency about product water footprints which lets them select better sustainable alternatives.

3. **Promote Sustainable Behavior:** Users should practice sustainability by understanding how decreasing their water use and pollution actively contributes to water conservation goals.

4. **Facilitate Data Accessibility:** H2O footprint data should be accessible through digital technologies to users for increased transparency of their consumption behavior.

5. **Support Water Management Efforts:** Your expertise in analyzing consumption patterns enables general water management systems to develop policy frameworks along with resource allocation distribution.

1.3 LIMITATIONS

i. **Data Availability and Accuracy** – Lack of reliable water usage data creates accuracy issues because the information is either absent or uncoherent.

ii. **Complexity of Assessment** – The measurement of both direct and indirect water consumption within supply chain systems proves difficult.

iii. **Adoption and Awareness Challenges** – Users alongside industries tend to maintain their current behavior patterns because they lack sufficient reasons or knowledge about the alternatives.

iv. **Technical Challenges** – Implementing AI, Big Data, and Blockchain for real- time analysis requires high computational power.

v. **Lack of Standardized Metrics** – Different methodologies lead to inconsistent water footprint calculations across industries.

CHAPTER-2

STUDY OF EXISTING SYSTEM

2.1 CASE STUDY

India launched the Water Footprint Calculation Project to measure water utilization within agricultural agriculture industry and domestic spheres. Through their utilization of AI-based technologies and Big Data processing and Blockchain platforms the initiative gathered water usage data and delivered time-sensitive information. Users could check the water footprint of their products through a mobile application or website by either scanning barcodes of products or manually entering product details. Through the tool industries could make their high water-using procedures more efficient and farmers obtained irrigation instructions to reduce water usage. The gathered data showed that agricultural operations consumed 80% of the total water usage focused on rice and sugarcane cultivation. This information helped policy authorities to create water conservation policies while also educating the public. The app feature allowing users to choose their local language provided broad accessibility especially to individuals located in rural regions. Water consumption decreased by 15% in specified regions because of this initiative which created better water sustainability through enhanced resource management and motivated personal along with community water usage awareness.

2.2 PROPOSED SYSTEM

Through its Water Footprint Calculation Project the organization intends to build a digital platform which delivers live updates on water utilization levels for all products along with services. The system will gather information by using AI and Big Data and Blockchain to analyze input from industries and agriculture and domestic homes. Users will have access to a simple website and mobile application that enables them to measure product water footprints through barcode scanning and product entry as well as image detection features.

Through the system users will get curated recommendations to minimize water consumption specifically in agricultural and industrial areas. Users across different linguistic regions can access the system because it provides support for multiple local languages. The achieved data serves as essential information for policymakers to establish improved water conservation policies. Real-time system analytics operates as an essential instrument that both monitors water consumption behaviors and stimulates sustainable water preservation advancements. The project works to reduce unnecessary water consumption while raising general awareness about appropriate water usage methods.

CHAPTER 3
DATABASE DESIGN

3.1 SOFTWARE REQUIREMENTS SPECIFICATION:

3.1.1. External Interface Requirements:

3.1.1.1 . User Interfaces:

a. Standard Web Browsers enable users to access the user-friendly web interface of the system.
b. The web interface enables users to start object detection processes while allowing them to view water footprint results through its control panel and support additional system features.
c. A mobile application development for both the iOS and Android operating systems will create interfaces which match web interface functionality.
d. Web interfaces should offer language selection capabilities together with localization features for different users.

3.1.1.2 Hardware Interfaces:

3.1.2 The system will operate through camera functions available in suitable versions of compatible devices.
3.1.3 The system requires smartphone and tablet and computer devices to perform object scanning.
3.1.4 The device interfaces need to support camera APIs and drivers which are widely used across different devices.
3.1.5 The system runs on any hardware which satisfies the requirements vital to execute the web interface or mobile application.
3.1.6 The system operates through web interface and mobile application running on devices.

3.1.1.3 Software Interfaces:

3.1.7 The system must link with external databases together with APIs in order to retrieve product information.
3.1.8 The system must use APIs to acquire information about products alongside production information and water distribution data from external sources.
3.1.9 The system needs cloud-based service integration for either data storage or processing needs or web application hosting.

3.1.1.4 Communications Interfaces:

3.1.2 The system needs to use standard HTTP(S) protocols for communication servers and servic- es.
3.1.3 Standardized methods need to exist for obtaining data together with processing requirem- ents.
3.1.4 The system needs to implement secure transmission protocols based on encryption to safeguard important information.
3.1.5 The system requires asynchronous communication patterns which enable concurrent user dealings to operate efficiently.
3.1.6 Efficient performance of user requests and data processing assignments is a requirement of the system.

3.1.2 System Features:

3.1.2.1 Object Detection

a. The system maintains the ability to identify different items using image recognition. recognition technology.
b. The system will use trained machine learning models to perform detection of objects. Web interface and mobile application users will find the ability to start object detection operations as a system requirement.
c. Real-time or near real-time execution shall be available for object detection because this requirement produces immediate results for users.
d. Users can depend on the system to properly identify detected objects when classification accuracy reaches at least 90% accuracy level.
e. The system detects a varied collection of ordinary home objects among its detection capabilities.
f. food products, beverages, and personal care items.

3.1.2.2 Water Footprint Calculation

g. This feature will compute the water footprint of detected items by using established metrics. predefined metrics and data sources.
h. The system should obtain necessary water footprint calculation data by accessing external sources.
i. Systems should perform water footprint calculations through assessment of water consumption starting from manufacturing operations up to transportation and conclusion phases.
j. transportation, and disposal phases.

k. The calculated water footprint results must use methodologies which have undergone scientific validation as well as industry standard approval and industry standards.
l. Users need to obtain detailed descriptions of water footprint elements that include virtual water usage and geographic allocation information.
m. virtual water usage and geographical distribution.
n. Users require direct access to water footprint calculation procedures for successful verification purposes.

3.1.2.3 Result Presentation

o. The system identifies detected items through its presentation feature which generates their calculated water footprints.
p. Users can view water footprint results through both web interface and mobile application display.
q. Users will find the complete water footprint value of each detected item within the presented results.
r. Users must have the ability to get detailed separations of water footprint subcomponents. such as blue water, green water, and grey water usage.
s. Visual representations using graphical charts will display water footprint results to all users. graphs, to enhance user understanding.
t. Users will possess the ability to both save and export water footprint reports which they can reference or share at any time.

3.1.2.4 User Management

u. The management of user accounts together with access permissions through this feature falls under its description.
v. Users need to create an account so the system provides access through defined authentication methods.restricted functionalities.
w. Authoritative system users possess the capability to create user profiles and modify these profiles as well as remove inactive accounts.
x. The system should enable administrators to set user roles and access permissions which will limit access to sensitive system data functionalities.
y. The system must apply password policies which will protect user account security through mandatory strength requirements.

CHAPTER 4
REQUIREMENT ANALYSIS AND SPECIFICATIONS

4.1. COLLECTION OF REQUIREMENTS

Testing Techniques-

To ensure a smooth and reliable user experience for our Flutter-based frontend, we followed a structured testing approach. Here's how we made sure everything worked perfectly:

RequirementBased Testing-

We started by aligning all tests with the project's core requirements. This helped us confirm that every feature not only functioned correctly but also met usability standards and overall project goals.

Functional Testing-

Every feature—from input forms and data visualization tools to navigation—was thoroughly checked to ensure it worked exactly as intended. No surprises, just seamless functionality.

Usability Testing-

A great app isn't just functional—it's also easy and intuitive to use. We tested the interface with real users to make sure it was accessible, straightforward, and enjoyable to interact with.

Integration Testing-

The frontend and backend needed to communicate flawlessly. We rigorously tested how the Flutter app interacted with APIs and backend services to ensure smooth data flow and reliability.

Performance Testing-

Speed and stability matter. We put the app through different scenarios to check its responsiveness and performance, making sure it stayed fast and stable under various conditions.

4.2 SOFTWARE REQUIREMENTS:

Frontend- HTML, CSS, Java Script, Bootstrap Backend-Python flask (Python 3.7) , SQL Alchemy,

- Operating System: Windows 10
- Google Chrome/Internet Explorer
- XAMPP (Version-3.7)
- Python main editor (user interface): PyCharm Community
- workspace editor: Sublime text 3

4.3 HARDWARE REQUIREMENTS

- Computer with a 1.1 GHz or faster processor
- Minimum 2GB of RAM or more
- 2.5 GB of available hard-disk space
- 5400 RPM hard drive
- 1366 × 768 or higher-resolution display
- DVD-ROM drive

4.4 CONCEPTUAL DESIGN

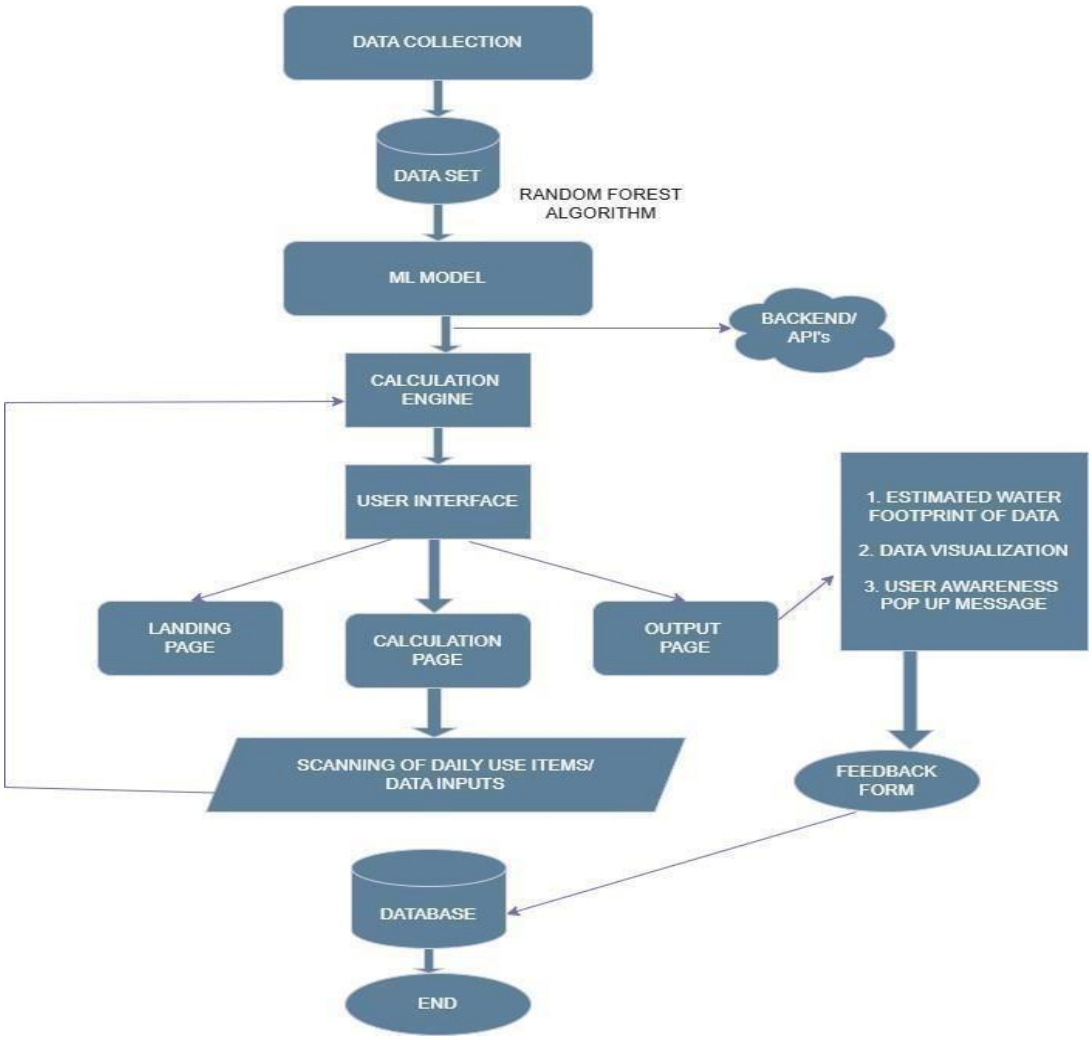


Figure 4.1 Conceptual Diagram

4.4.1 ER DIAGRAM

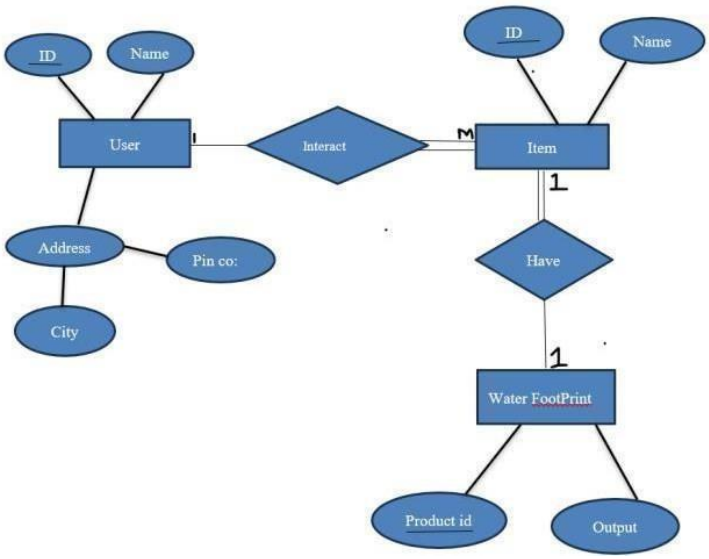


Figure 4.2 Relationship Diagram

4.4.2 FLOWCHART

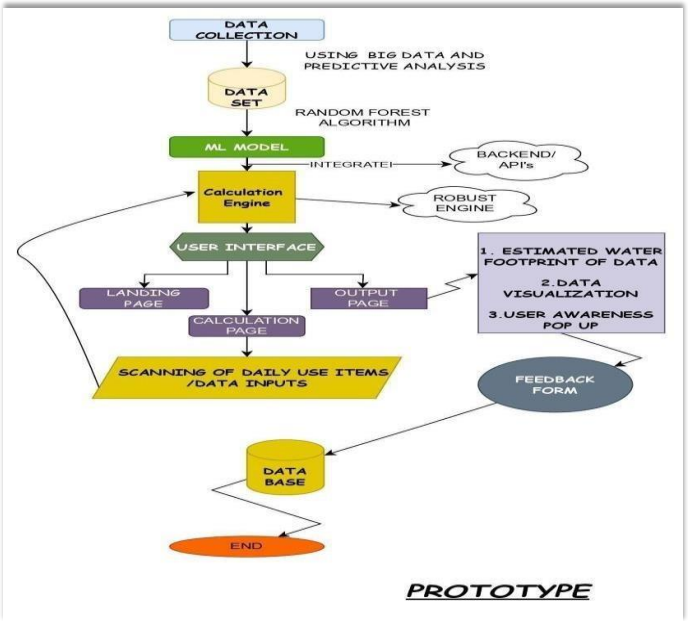


Figure 4.3 Flowchart

4.4.3 SCHEMA DIAGRAM

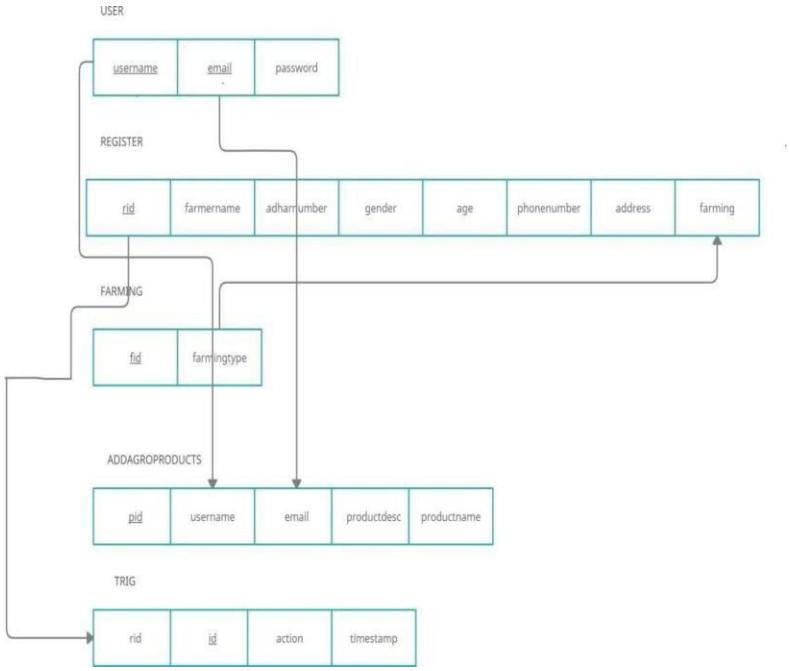


Figure 4.4 Schema Diagram

4.4.4 USE CASE DIAGRAM

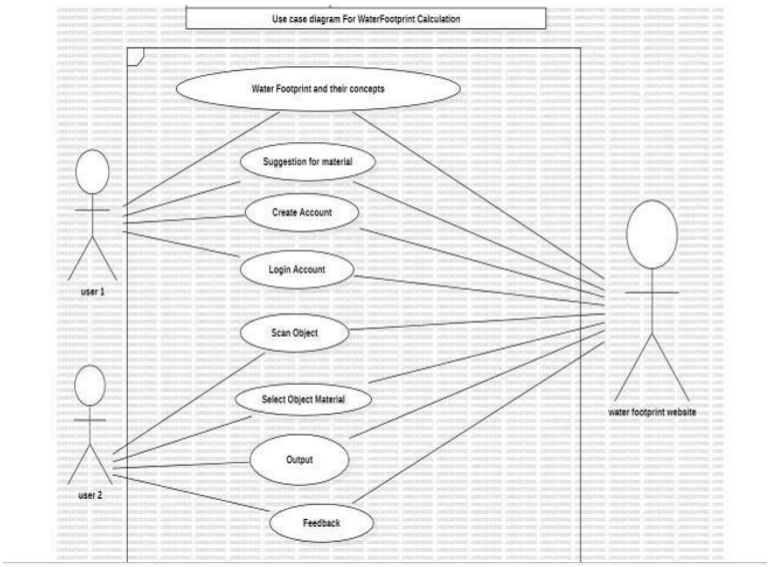


Figure 4.5 Use Case Diagram

CHAPTER 5
IMPLEMENTATION

An operational system for calculating water consumption needs three main components that consist of a well- organized database together with an accessible user interface and efficient processing capabilities in backend infrastructure. This page includes a structured plan for implementation as follows:

1.1. BACK-END

Database:

A Database Management System (DBMS) functions as computer software that allows users to manage structural data within databases and operate database requests for many users. Oracle, DB2, Microsoft Access and Microsoft SQL Server and Firebird together with PostgreSQL and MySQL form typical examples of DBMSs. The list continues with SQLite, FileMaker and Sybase Adaptive Server Enterprise. Database administrators rely on DBMSs to build all Database systems. DBMS systems find their typical applications in accounting programs and systems for human resources management and customer service operations. Large-scale companies used to be the only segment with the hardware capacity for managing extensive data sets before DBMSs became mainstream for company back offices.

A database management system represents a sophisticated suite of computer software that directs data organization together with storage and management and retrieval capabilities of database records. A DBMS includes:

Every database inside the DBMS requires a modeling language to establish its schema based on the DBMS data model.
Presently the ad hoc model embedded in SQL remains dominant although relational model purists consider it to be a corrupted implementation which violates multiple foundational relational principles merely for better practicality and higher performance. The Open Database Connectivity API lets programmers access the DBMS through a standard interface that many DBMSs provide.

The data structures use optimized fields, records, files and objects that address large volume data stored on permanent data storage devices with slower retrieval times than main memory. Users access the system through a database query language together with reporting capabilities.

The writer tool enables user interaction with a database for data analysis through inquiry while following user-based permission levels.
The implementation of data security blocks unauthorized users from both viewing and updating databases. The database gives users permission to view the entire system through passwords and also provides access to sub categories of data referred to as sub schemas. An employee database

contains complete employee records which particular groups can only see payroll data or work history and student information respectively.
The interactive features which the DBMS provides for entering and updating databases and interrogation serve personal database management needs. The system does not create automated documentation about user activities nor fully support organizational multi- user control requirements. A set of custom-built application programs must exist to enable these controls during data entry and updating activities.
The system requires a transaction mechanism offering full ACID support for maintaining data integrity during simultaneous user interactions and hardware failures.
It also maintains the integrity of the data in the database.
Through its functionality the DBMS protects database integrity by preventing simultaneous updates to the same record by different users. The DBMS enforces unique index constraints to prevent duplicate records from entering the database when customer numbers serve as key fields. The full description of ACID properties explains this method better (Redundancy avoidance).

The adoption of a DBMS enables information systems to adapt more readily because organizations transform their data requirements. Organizations generally run their daily transaction programs through one type of DBMS before transferring details to a different DBMS system for analysis needs. Data administrators together with systems analysts perform the overall systems design. Database administrators carry out the process of detailed database design.

SQL:

The programming language Structured Query Language (SQL) serves to manipulate relational database systems. The relational model contains a tight connection with Structured Query Language (SQL).

- In the relational model, data is stored in structures called relations or tables.

SQL statements are issued for the purpose of:

- Data definition: Defining tables and structures in the database (DDL used to create, alter and drop schema objects such as tables and indexes).

5.2. STORED PROCEDURE

Routine name:
proc Type:
procedur e
Definition: Select * from register;

Triggers

It is the special kind of stored procedure that automatically executes when an event occurs in the database.

Triggers used :

on insert Table:
register

Time: after Event:

insert

INSERT INTO trig VALUES(null,NEW.rid,'Farmer Inserted',NOW())

on deleteTable:

register Time:

after Event:

delete

Definition: INSERT INTO trig VALUES(null,OLD.rid,'FARMER DELETED',NOW())

on update Table:

register Time:

after Event:

update

Definition: INSERT INTO trig VALUES(null,NEW.rid,'FARMER UPDATED',NOW())

5.3. BACKEND PYHTON WITH MYSQL CODE

```
from    flask   import Flask,render_template,request,session,redirect,url_for,flash
from flask_sqlalchemy import SQLAlchemy from flask_login import UserMixin  from
werkzeug.security
import generate_password_hash,check_password_hash from flask_login
import
login_user,logout_user,login_manager,LoginManager  from flask_login import
login_required,current_user



# MY  db connection local_server= True app = Flask( name
)
app.secret_key='ha rshithbhaska r'
# this is for getting unique user
access login_manager=LoginMana ger(app) login_manager.login_view
='login'


@login_manager. user_loader def load_user(user_i d):
return User.query.get(int(user_id))
```

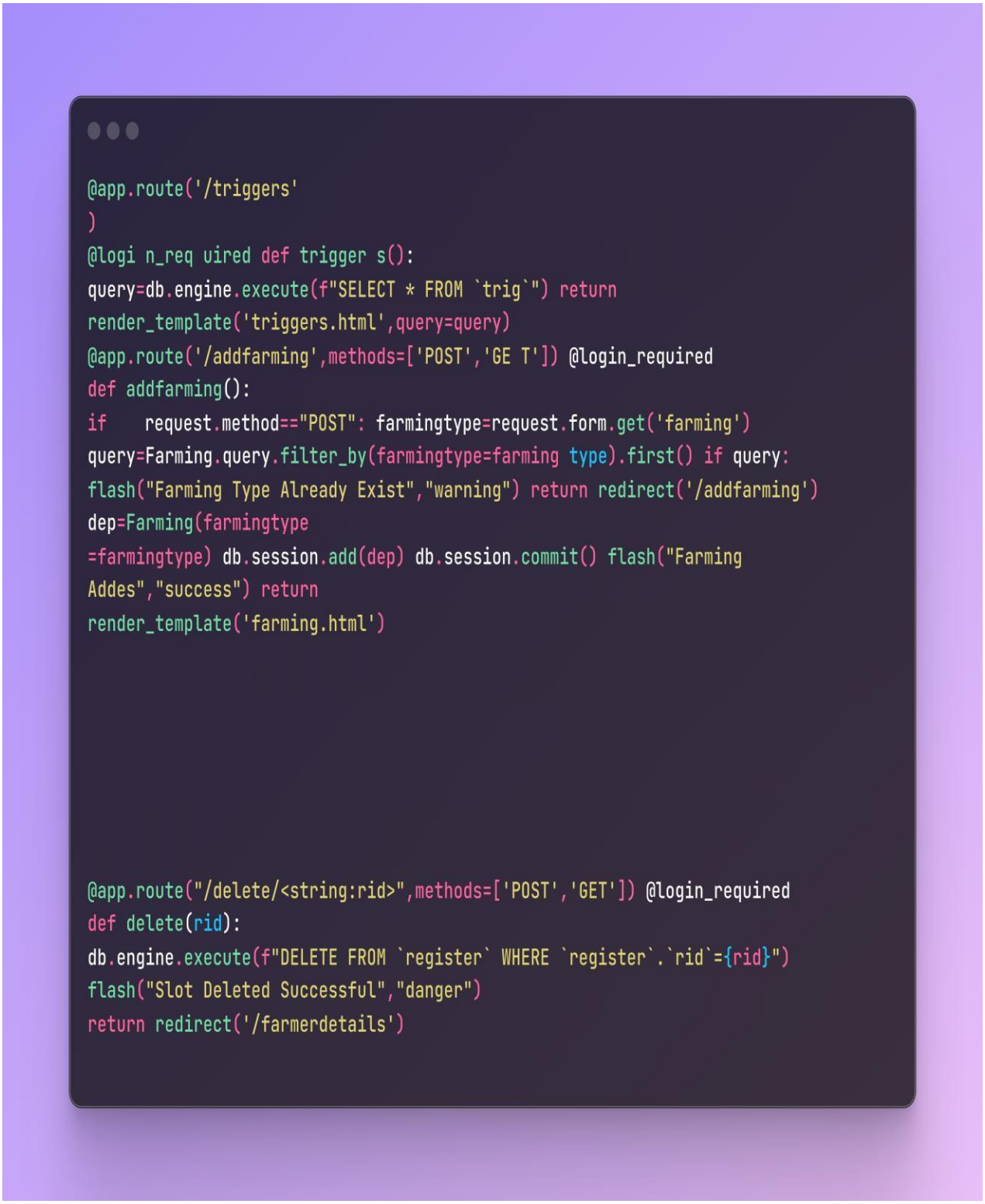
Figure 5.1 User Authentication

```
class Trig(db.Model):
id=db.Column(db.Integer,primary_key=T rue)  fid=db.Column(db.String(100))
action=db.Column(db.String(100)) timestamp=db.Column(db.String(100))
class User(UserMixin,db.Model): id=db.Column(db.Integer,primary_key=True)
username=db.Column(db.String(50)) email=db.Column(db.String(50),unique=True)
password=db.Column(db.String(1000))

class Register(db.Model):
rid=db.Column(db.Integer,primary_key= True) farmername=db.Column(db.String(50))
adharnumber=db.Column(db.String(50)) age=db.Column(db.Integer)
gender=db.Column(db.String(50)) phonenumber=db.Column(db.String(50))
address=db.Column(db.String(50)) farming=db.Column(db.String(50))
@a pp. rou te('/
')
def ind ex(
):
return render_template('index.html')
```

Figure 5.2 Flask Model

```
@app.route('/farmerdetails') @login_required
def farmerdetails(): query=db.engine.execute(f"SELECT * FROM
`register`")  return
render_template('farmerdetails.html',query=quer y)

@app.route('/agro products')  def agroproducts():
query=db.engine.execute(f"SELECT  * FROM
`addagroproducts`") return
render_template('agroproducts.html',query=query)


@app.route('/addagroproduct',methods=['PO
ST','GET']) @login_required def addagroproduct():
if    request.method=="POST": username=request.form.get('username'
)
email=request.form.get('email') productname=request.form.get('productname')
productdesc=request.form.get('productdesc') price=request.form.get('price')

products=Addagroproducts(username=username,email=email,productname=productname,pro
ductdesc=pr od uctdesc,price=price) db.session.add(products) db.session.commit()
flash("Product Added","info") return redirect('/agroproducts')

return render_template('addagroproducts.html')
```

Figure 5.3 Agro Portal

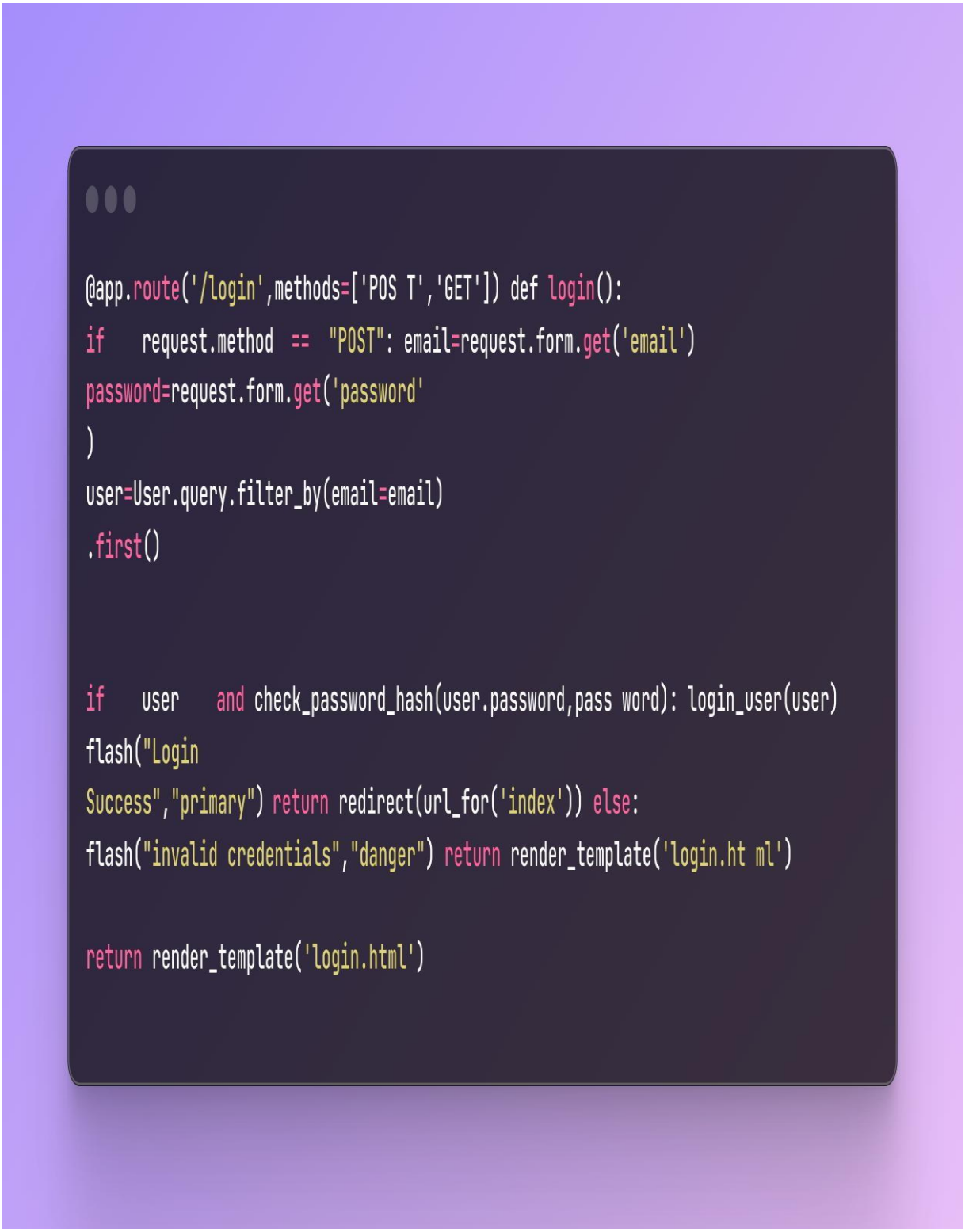


```
@app.route('/triggers'
)
@logi n_req uired def trigger s():
query=db.engine.execute(f"SELECT * FROM `trig`") return
render_template('triggers.html',query=query)
@app.route('/addfarming',methods=['POST','GE T']) @login_required
def addfarming():
if    request.method=="POST": farmingtype=request.form.get('farming')
query=Farming.query.filter_by(farmingtype=farming type).first() if query:
flash("Farming Type Already Exist","warning") return redirect('/addfarming')
dep=Farming(farmingtype
=farmingtype) db.session.add(dep) db.session.commit() flash("Farming
Addes","success") return
render_template('farming.html')



@app.route("/delete/<string:rid>",methods=['POST','GET']) @login_required
def delete(rid):
db.engine.execute(f"DELETE FROM `register` WHERE `register`.`rid`={rid}")
flash("Slot Deleted Successful","danger")
return redirect('/farmerdetails')
```

Figure 5.4 Trigger Management

```
@app.route("/edit/<string:rid>",methods=['P OST','GET']) @login_required
def edit(rid): farming=db.engine.execute("SELECT * FROM
`farming`")
posts=Register.query.filter_by(rid=rid).first()  if request.method=="POST":
farmername=request.form.get('farmername') adharnumber=request.form.get('adharnumber')
age=request.form.get('age') gender=request.form.get('gender')
phonenumber=request.form.get('phonenumber') address=request.form.get('address')
farmingtype=request.form.get('farmingtype') query=db.engine.execute(f"UPDATE `register` SET
`farmername`='{farmername}',`adharnumber`='{adharnumber}',`age`='{age}',`gender`='{gender}',`
nu  mber`='{phonenumber}',`address`='{address}',`farming`='{farmingtype}'")
flash("Slot is
Updates","success") return redirect('/farmerdetails')
return render_template('edit.html',posts=posts,farming=farming)



@app.route('/signup',methods=['PO ST','GET']) def signup():
if  request.method  ==  "POST": username=request.form.get('username')
email=request.form.get('email')
password=request.form.get('passwo rd') print(username,email,password)
user=User.query.filter_by(email=e mail).first()  if user:
flash("Email Already Exist","warning") return render_template('/signup.h tml')
encpassword=generate_password_hash(password)
new_user=db.engine.execute(f"INSERT INTO  `user`  (`username`,`email`,`password`) VALUES
('{username}','{email}','{encpassword}')")

# this is method 2 to save data in db #
newuser=User(username=username,email=email,pass word=encpassword)  # db.session.add(newuser)
#
db.session.commit()
flash("Signup Succes Please Login","success") return render_template('login.html')




return render_template('signup.html')
```

Figure 5.5 User Signup



```
@app.route('/login',methods=['POS T','GET']) def login():
if    request.method  ==  "POST": email=request.form.get('email')
password=request.form.get('password'
)
user=User.query.filter_by(email=email)
.first()


if    user    and check_password_hash(user.password,pass word): login_user(user)
flash("Login
Success","primary") return redirect(url_for('index')) else:
flash("invalid credentials","danger") return render_template('login.ht ml')

return render_template('login.html')
```

Figure 5.6 User Login

5.4. FRONT-END CODE

```
<!DOCTYPE html>
<html lang="en">


<head>
<meta charset="utf-8">
<meta content="width=device-width, initial-scale=1.0" name="viewport">


<title>{% block title %}
{% endblock title %}</title>
<meta content="" name="description">
<meta content="" name="keywords">


{% block style %}
{% endblock style %}
<link href="https://fonts.googleapis.com/css?
family=Open+Sans:300,300i,400,400i,700,7 00i|Raleway: 300,400,50 0,700,800"
rel="stylesheet">

<!-- Vendor CSS Files -->
<link href="static/assets/vendor/bootstrap/css/bootstrap.min.css" rel="stylesheet">
<link href="static/assets/vendor/venobox/venobox.css" rel="stylesheet">
<link href="static/assets/vendor/font-awesome/css/font-awesome.min.css"
rel="stylesheet">
<link href="static/assets/vendor/owl.carousel/assets/owl.carousel.min.css"
rel="stylesheet"> <link href="static/assets/vendor/aos/aos.css" rel="stylesheet">

<!-- Template Main CSS File -->
<link href="static/assets/css/style.css" rel="stylesheet">



</head>
<body>
<!-- ======= Header ======= -->
<header id="header">
<div class="container">


<div id="logo" class="pull-left">


<a href="/" class="scrollto">F.M.S</a>
</div>


<nav id="nav-menu-container">
<ul class="nav-menu">
<li class="{% block home %}
{% endblock home %}"><a href="/">Home</a></li>


<li><a href="/register">Farmer Register</a></li>
<li><a href="/addfarming">Add Farming</a></li>
<li><a href="/farmerdetails">Farmer Details</a></li>
<li><a href="/agroproducts">Agro Products</a></li>
<li><a href="/triggers">Records</a></li>

{% if current_user.is_authenticated %}
<li class="buy-tickets"><a href="">Welcome {{current_user.username}}</a></li>
<li class="buy-tickets"><a href="/logout">Logout</a></li>
{% else %}
<li class="buy-tickets"><a href="/signup">Signin</a></li>


{% endif %}
</ul>
</nav><!-- #nav-menu-container -->
```

Figure 5.7 Layout Template

```
</div>
</header><!-- End Header -->


<!-- ======= Intro Section ======= -->
<section id="intro">
<div class="intro-container" data-aos="zoom-in" data-aos-delay="100">
<h1 class="mb-4 pb-0">SELL AGRO PRODUCTS AND BUY </span> </h1>
<p  class="mb-4 pb-0">DBMS  Mini  Project Using Flask & MYSQL</p>


<a  href="/agroproducts"  class="about-btn scrollto">AGRO PRODUCTS</a> </div>
</section><!-- End Intro Section -->
<main id="main">

{% block body %}


{% with messages=get_flashed_messages(with_categories=true) %}
{% if messages %}
{% for category, message in messages %}


<div class="alert alert-{{category}} alert-dismissible fade show" role="alert">
{{message}}



</div>



{% endfor %}
{% endif %}
{% endwith %}
{% endblock body %}
```

Figure 5.8 Agro Product Market Place

```
</div>
</header><!-- End Header -->


<!-- ======= Intro Section ======= -->
<section id="intro">
<div class="intro-container" data-aos="zoom-in" data-aos-delay="100">
<h1 class="mb-4 pb-0">SELL AGRO PRODUCTS AND BUY </span> </h1>
<p  class="mb-4 pb-0">DBMS  Mini  Project Using Flask & MYSQL</p>


<a  href="/agroproducts"  class="about-btn scrollto">AGRO PRODUCTS</a> </div>
</section><!-- End Intro Section -->
<main id="main">

{% block body %}


{% with messages=get_flashed_messages(with_categories=true) %}
{% if messages %}
{% for category, message in messages %}


<div class="alert alert-{{category}} alert-dismissible fade show" role="alert">
{{message}}



</div>



{% endfor %}
{% endif %}
{% endwith %}
{% endblock body %}
```

Figure 5.9 Home Page Highlight

```
</div>
</header><!-- End Header -->


<!-- ======= Intro Section ======= -->
<section id="intro">
<div class="intro-container" data-aos="zoom-in" data-aos-delay="100">
<h1 class="mb-4 pb-0">SELL AGRO PRODUCTS AND BUY </span> </h1>
<p  class="mb-4 pb-0">DBMS  Mini  Project Using Flask & MYSQL</p>


<a  href="/agroproducts"  class="about-btn scrollto">AGRO PRODUCTS</a> </div>
</section><!-- End Intro Section -->
<main id="main">

{% block body %}


{% with messages=get_flashed_messages(with_categories=true) %}
{% if messages %}
{% for category, message in messages %}


<div class="alert alert-{{category}} alert-dismissible fade show" role="alert">
{{message}}



</div>



{% endfor %}
{% endif %}
{% endwith %}
{% endblock body %}
```

Figure 5.10 Home Page Alert Layout

```
<a href="#" class="back-to-top"><i class="fa fa-angle-up"></i></a>
<!-- Vendor JS Files -->
<script src="static/assets/vendor/jquery/jquery.min.js"></script>
<script src="static/assets/vendor/bootstrap/js/bootstrap.bundle.min.js"></script>
<script src="static/assets/vendor/jquery.easing/jquery.easing.min.js"></script>
<script src="static/assets/vendor/php-email-form/validate.js"></script>
<script src="static/assets/vendor/venobox/venobox.min.js"></script>
<script src="static/assets/vendor/owl.carousel/owl.carousel.min.js"></script>
<script src="static/assets/vendor/superfish/superfish.min.js"></script>
<script src="static/assets/vendor/hoverIntent/hoverIntent.js"></script>
<script src="static/assets/vendor/aos/aos.js"></script>



<!-- Template Main JS File -->
<script src="static/assets/js/main.js"></script>


</body>
</html> <!DOCTYPE html>
<html lang="en">


<head>
<meta charset="utf-8">
<meta content="width=device-width, initial-scale=1.0" name="viewport">


<title>{% block title %}
{% endblock title %}</title>
<meta content="" name="description">
<meta content="" name="keywords">


{% block style %}
{% endblock style %}
<link
```

Figure 5.11 Script And Template based

```
href="https://fonts.googleapis.com/css?family=Open+Sans:300,300i,400,400i,700,7
00i|Raleway: 300,400,50 0,700,800" rel="stylesheet">
<!-- Vendor CSS Files -->
<link href="static/assets/vendor/bootstrap/css/bootstrap.min.css" rel="stylesheet">
<link href="static/assets/vendor/venobox/venobox.css" rel="stylesheet">
<link href="static/assets/vendor/font-awesome/css/font-awesome.min.css"
rel="stylesheet">
<link href="static/assets/vendor/owl.carousel/assets/owl.carousel.min.css"
rel="stylesheet">
<link href="static/assets/vendor/aos/aos.css" rel="stylesheet">


<!-- Template Main CSS File -->
<link href="static/assets/css/style.css" rel="stylesheet">



</head>


<body>


<!-- ======= Header ======= -->
<header id="header">
<div class="container">
<div id="logo" class="pull-left">


<a href="/" class="scrollto">F.M.S</a>
</div>


<nav id="nav-menu-container">
<ul class="nav-menu">
<li class="{% block home %}
{% endblock home %}"><a href="/">Home</a></li>


<li><a href="/register">Farmer Register</a></li>
<li><a href="/addfarming">Add Farming</a></li>
<li><a href="/farmerdetails">Farmer Details</a></li>
```

Figure 5.12 Header And Style

```
{% if current_user.is_authenticated %}
<li class="buy-tickets"><a href="">Welcome {{current_user.username}}</a></li>
<li class="buy-tickets"><a href="/logout">Logout</a></li>
{% else %}
<li class="buy-tickets"><a href="/signup">Signin</a></li>


{% endif %}
</ul>
</nav><!-- #nav-menu-container -->
</div>
</header><!-- End Header -->


<!-- ======= Intro Section ======= -->

<section id="intro">
<div class="intro-container" data-aos="zoom-in" data-aos-delay="100">
<h1 class="mb-4 pb-0">SELL AGRO PRODUCTS AND BUY </span> </h1>
<p class="mb-4 pb-0">DBMS Mini Project Using Flask & MYSQL</p>



<a  href="/agroproducts"  class="about-btn scrollto">AGRO PRODUCTS</a> </div>
</section><!-- End Intro Section -->
<main id="main">



{% block body %}


{% with messages=get_flashed_messages(with_categories=true) %}
{% if messages %}
{% for category, message in messages %}


<div class="alert alert-{{category}} alert-dismissible fade show" role="alert">
```

Figure 5.13 User Navigation

```
{{message}}



</div>



{% endfor %}
{% endif %}
{% endwith %}
{% endblock body %}



<a href="#" class="back-to-top"><i class="fa fa-angle-up"></i></a>

<!-- Vendor JS Files -->
<script src="static/assets/vendor/jquery/jquery.min.js"></script>
<script src="static/assets/vendor/bootstrap/js/bootstrap.bundle.min.js"></script>
<script src="static/assets/vendor/jquery.easing/jquery.easing.min.js"></script>
<script src="static/assets/vendor/php-email-form/validate.js"></script>
<script src="static/assets/vendor/venobox/venobox.min.js"></script>
<script src="static/assets/vendor/owl.carousel/owl.carousel.min.js"></script>
<script src="static/assets/vendor/superfish/superfish.min.js"></script>
<script src="static/assets/vendor/hoverIntent/hoverIntent.js"></script>
<script src="static/assets/vendor/aos/aos.js"></script>



<!-- Template Main JS File -->
<script src="static/assets/js/main.js"></script>


</body>


</html>
```

Figure 5.14 Flash Messages and Scripts

```
{% extends 'base.html' %}
{%
block title %} Add Farming
{% endblock title %}


{% block body %}
<h3 class="text-center bg-success text-white"><span>Add Farming</span> </h3>


{% with messages=get_flashed_messages(with_categories=true) %}
{% if messages %}
{% for category, message in messages %}


<div class="alert alert-{{category}} alert-dismissible fade show" role="alert">
{{message}}



</div>
{% endfor %}
{% endif %}
{% endwith %}
<br>
<div class="container">


<div class="row">


<div class="col-md-4"></div>
<div class="col-md-4">
<form action="/addfarming" method="post">
```

Figure 5.15 Framing Form

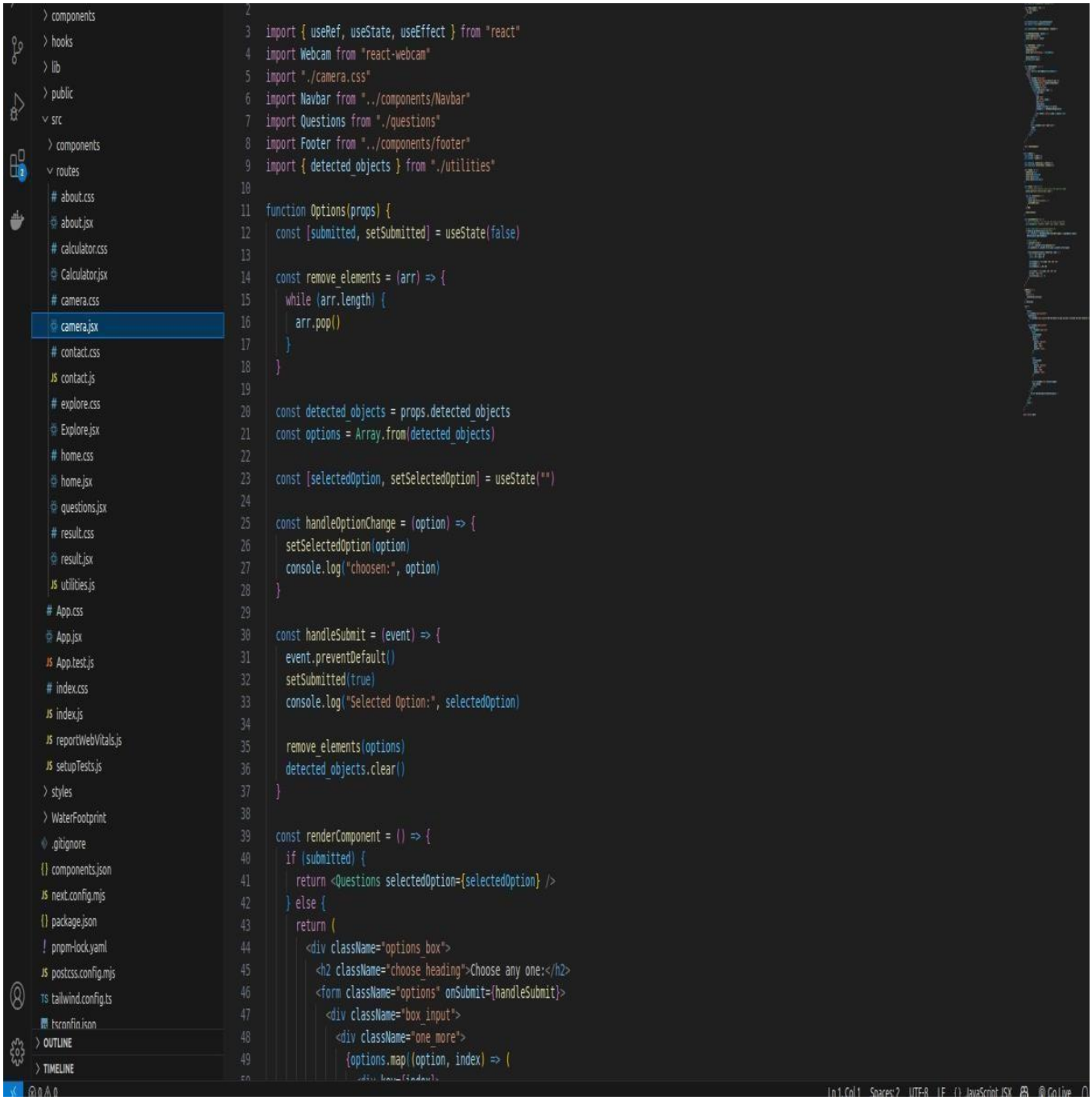


Figure 5.16 layout code

5.5. OBJECT DETECTION MODEL CODE:

In [7]:
```
df.isnull().sum()
```

Out[7]:
```
id             0
name           0
ingredients    0
qt             0
wf             0
dtype: int64
```

In [8]:
```
from sklearn.preprocessing import OrdinalEncoder
encoder = OrdinalEncoder()
df['name'] = encoder.fit_transform(df[['name']])
```

```
C:\Users\shubh\AppData\Local\Temp\ipykernel_8384\3159346859.py:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df['name'] = encoder.fit_transform(df[['name']])
```

In [9]:
```
encoder = OrdinalEncoder()
df['ingredients'] = encoder.fit_transform(df[['ingredients']])
```

```
C:\Users\shubh\AppData\Local\Temp\ipykernel_8384\1157950787.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df['ingredients'] = encoder.fit_transform(df[['ingredients']])
```

In [10]:
```
encoder = OrdinalEncoder()
df['qt'] = encoder.fit_transform(df[['qt']])
```

```
C:\Users\shubh\AppData\Local\Temp\ipykernel_8384\625780882.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df['qt'] = encoder.fit_transform(df[['qt']])
```

Figure 5.17 Feature Engineering

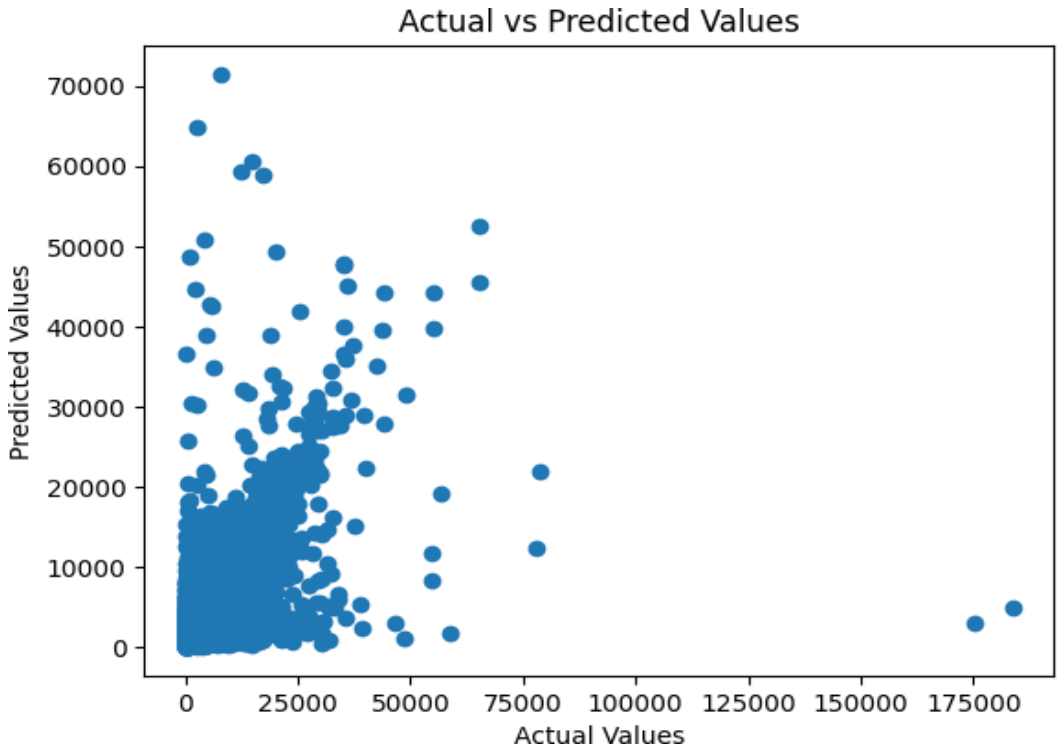


Figure 5.18 Scatter Diagram

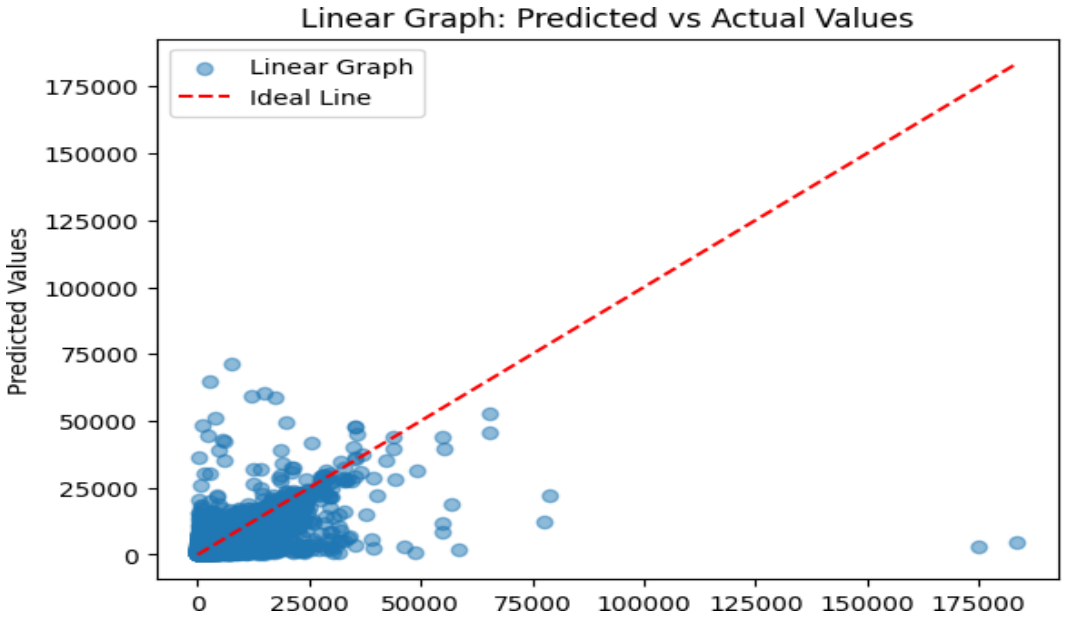


Figure 5.19 Linear Diagram

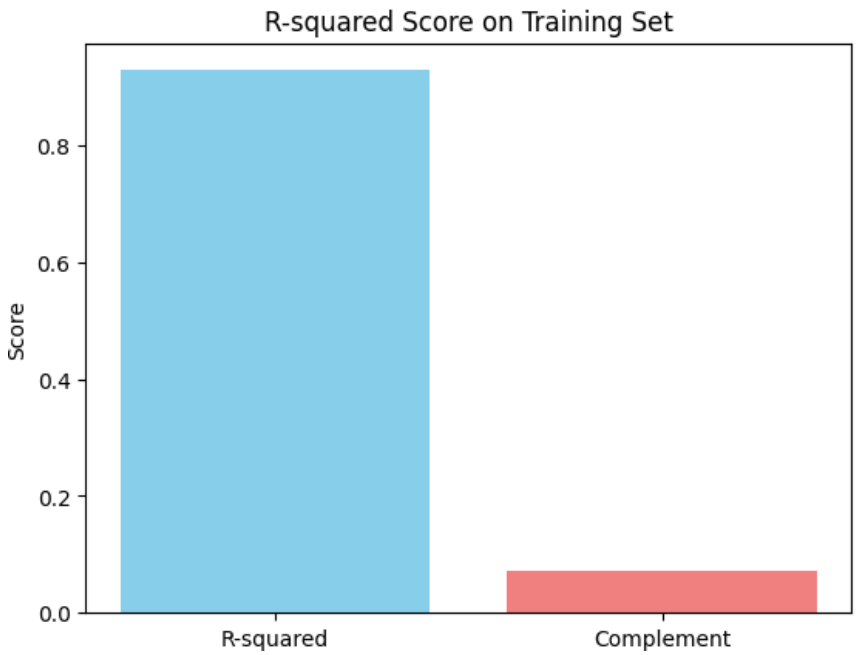


Figure 5.20 Bar Diagram

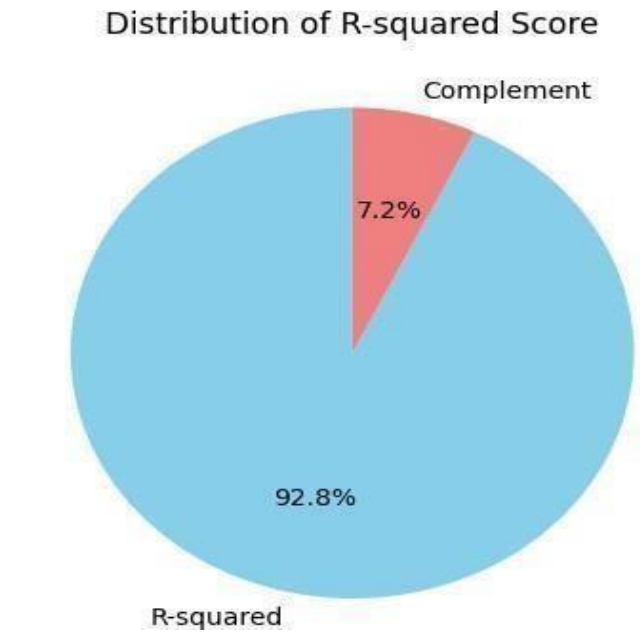


Figure 5.21 Pie Chart

MODEL WORKING FLOW:

	id	name	ingredients	qt	wf
0	137739	arriba baked winter squash mexican style	['winter squash', 'mexican', '', 'honey', 'but...	[453.5, 5.0, 5.0, 5.0, 5.0, 5.0, 5.0]	350.29
1	31490	a bit different breakfast pizza	['pizza', 'sausage patti', 'egg', 'milk', 'sal...	[100.0, 500.0, 111.0, 5.0, 5.0, 5.0]	2030.02
2	112140	all in the kitchen chili	['beef', 'onion', 'tomato', 'tomato past', 'to...	[907.0, 80.0, 35.0, 15.0, 500.0, 5.0, 5.0, 5.0...	14195.34
3	59389	alouette potatoes	['spreadable cheese garlic herb', 'potato', 's...	[500.0, 12.0, 500.0, 10.0, 5.0, 5.0, 5.0, 5.0,...	1150.33
4	44061	amish tomato ketchup for canning	['tomato juic', 'apple cider vinegar', 'sugar'...	[90.0, 473.0, 948.0, 5.0, 5.0, 5.0, 5.0, 5.0]	1616.62
...	...	...	...	...	...
230543	197449	mom s christmas breakfast make ahead	['bread', 'sharp dar chees', 'smokies sausag',...	[2400.0, 711.0, 453.5, 185.0, 5.0, 5.0, 5.0]	5479.45
230544	49321	mom s christmas carrot pudding	['carrot', 'potato', 'appl', 'sugar', 'raisin'...	[237.0, 237.0, 237.0, 237.0, 237.0, 5.0, 5.0, ...	1735.93
230545	342144	mom s chuck roast my favorite	['chuck', 'kitchen bouquet', 'garlic clov', 'o...	[1360.5, 500.0, 500.0, 2.0, 5.0, 5.0, 5.0, 5.0]	2012.58
230546	53946	mom s chuckwagon beans	['beef', 'onion', 'bacon', 'northern bean', 'k...	[453.5, 80.0, 12.0, 500.0, 5.0, 5.0, 5.0, 5.0,...	7485.53
230547	99997	mom s cinnamon cake with zucchini	['zucchini', 'sugar', 'oil', 'egg', 'flour', '...	[711.0, 711.0, 237.0, 148.0, 711.0, 5.0, 5.0, ...	5351.88

230548 rows × 5 columns

```
import pandas as pd
from sklearn.pipeline import Pipeline
from sklearn.ensemble import GradientBoostingRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.impute import SimpleImputer
from sklearn.metrics import r2_score
from sklearn.linear_model import LinearRegression
```

CHAPTER 6
TESTING AND MAINTAINANCE

6.1. TESTING METHODOLOGIES:

To build a reliable and user-friendly app, we followed a smart and flexible testing approach. Here's how we did it:

Agile Testing-

a. Testing wasn't an afterthought—it was part of every development sprint.
b. By checking features early and often, we ensured steady progress and high quality at every step.

Black-Box Testing-

a. We put ourselves in the users' shoes, testing the app just like they would— without worrying about the code underneath.
b. This helped us focus on real-world usability rather than just technical correctness.

Exploratory Testing-

a. Sometimes, the best bugs are the ones you don't expect.
b. We went off-script to hunt down hidden issues that structured tests might miss, making the app more robust.

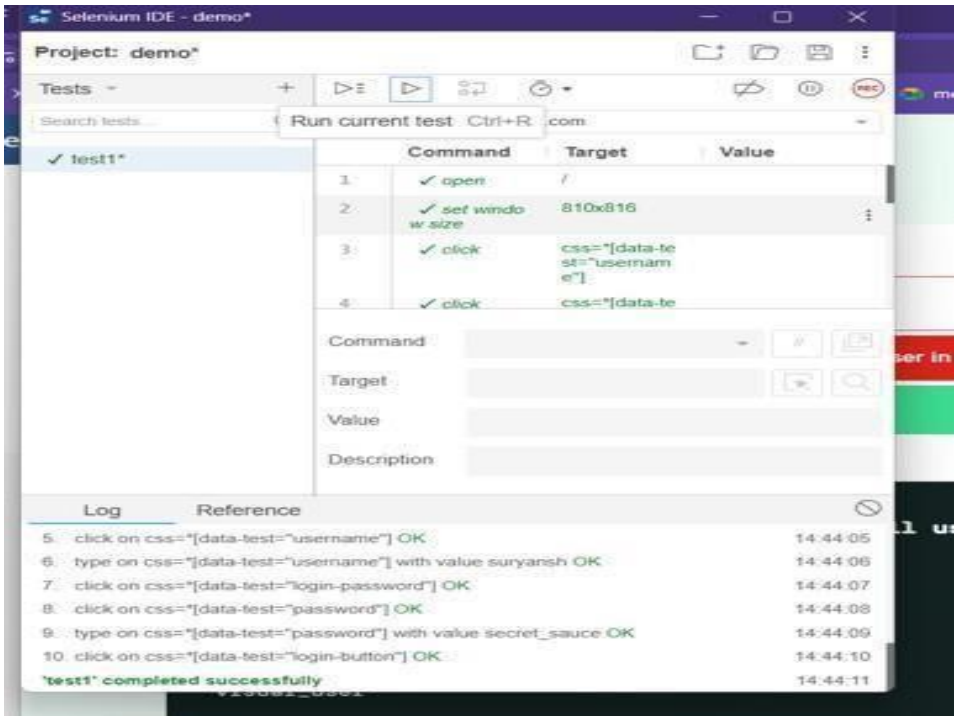
Cross-Platform Testing-

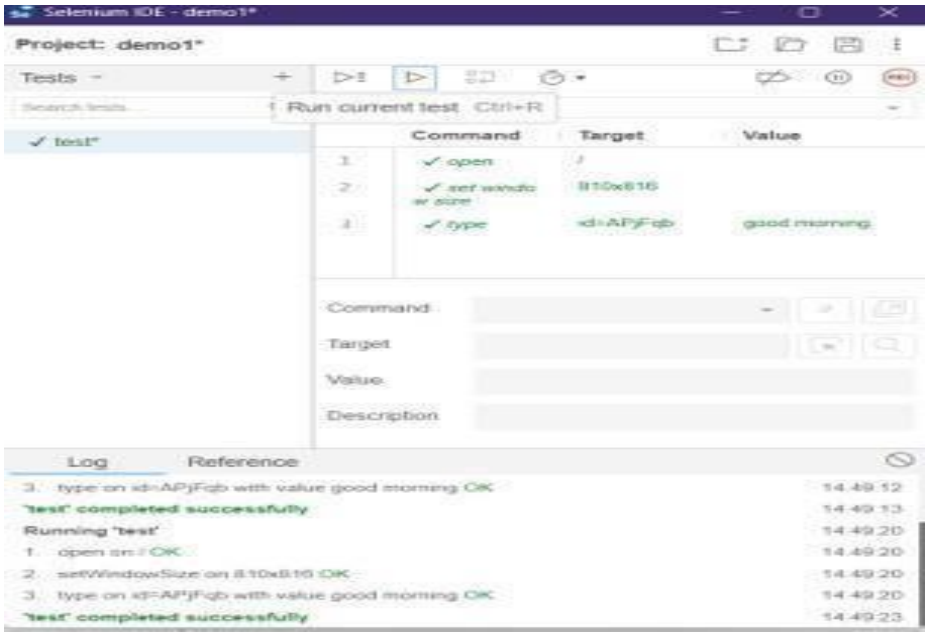
a. Since Flutter works on both Android and iOS, we made sure the app looked and behaved perfectly on both platforms.
b. No surprises—just a smooth experience, no matter the device.

Automation Testing-

a. Why waste time on repetitive checks? We used smart tools to handle regression, performance, and other routine tests.
b. Faster results, fewer errors, and more time to focus on what really matters— building great featur

6.2. TEST DELIVERABLES:





6.3. BUG REPORT

Design a bug report through Mantis BT.

Bug ID	Summary	Description	Severity	Priority	Status	Steps to Reproduce	Assigned To
001	Incorrect Rainfall Input Validation	Rainfall input allows values greater than 500 mm, which is beyond the valid range.	Major	High	Open	1. Navigate to input form. 2. Enter 600 mm in rainfall field. 3. Submit form. 4. Observe incorrect acceptance.	Developer A
002	Negative Values Accepted for Water Use	Daily water usage field allows negative values, causing incorrect calculations in the report.	Critical	Immediate	Open	1. Enter -50 liters in water usage field. 2. Submit form. 3. Observe the invalid input is processed.	Developer B
003	Performance Issue with Large Datasets	Calculation takes more than 5 minutes to process datasets with more than 1,000 entries, causing timeouts.	Major	Medium	Open	1. Upload dataset with 1,000+ entries. 2. Click calculate. 3. Observe processing time exceeds acceptable limits.	Performance Team
004	UI Error on Result Page	Results page displays "NaN" instead of values when no input is provided for optional parameters.	Minor	Low	Open	1. Leave optional parameters blank. 2. Submit form. 3. Observe "NaN" displayed in the output fields.	UI/UX Specialist
005	Incorrect Unit Conversion	Water footprint calculation converts millimeters to liters incorrectly, leading to inaccurate results.	Major	High	Open	1. Enter 50 mm in rainfall field. 2. Check the result. 3. Observe incorrect conversion in output.	Backend Developer C

6.4. Requirement Traceability Matrix (RTM)

Requirement ID	Requirement Description	Design Specification	Test Case ID	Status	Comments
R-001	System must validate daily water usage between 0 and 10,000 liters.	Input Validation Module	TC-01 to TC-06	Pass	Boundary and invalid values tested successfully.
R-002	System must validate rainfall input between 0 and 500 mm.	Input Validation Module	TC-07 to TC-12	Pass	Handled valid and invalid input scenarios.
R-003	System must calculate the water footprint based on valid inputs.	Calculation Algorithm	TC-25 to TC-30	In Progress	Complex combinations require additional testing.
R-004	System must handle datasets with up to 1,000 entries.	Performance Opti↓tion	TC-31 to TC-35	Fail	Performance issue logged as Bug 003 in MantisBT.
R-005	System must convert rainfall (mm) to liters accurately.	Conversion Formula	TC-36 to TC-40	Pass	Verified accuracy using test data.
R-006	UI must display results in a user-friendly format.	User Interface Design Specification	TC-41 to TC-45	Pass	UI layout and NaN handling verified.
R-007	System must reject negative or non-numeric inputs.	Input Validation Module	TC-46 to TC-50	Pass	Negative and invalid inputs correctly rejected.

6.5. Boundary Value analysis:

Test Case ID	Input Value (liters)	Expected Output
TC-01	-1	Error: Invalid Input
TC-02	0	Valid Input: Pass
TC-03	1	Valid Input: Pass
TC-04	9,999	Valid Input: Pass
TC-05	10,000	Valid Input: Pass
TC-06	10,001	Error: Invalid Input

CHAPTER 7
TESTING AND MAINTAINANCE

7.1 SNAPSHOTS

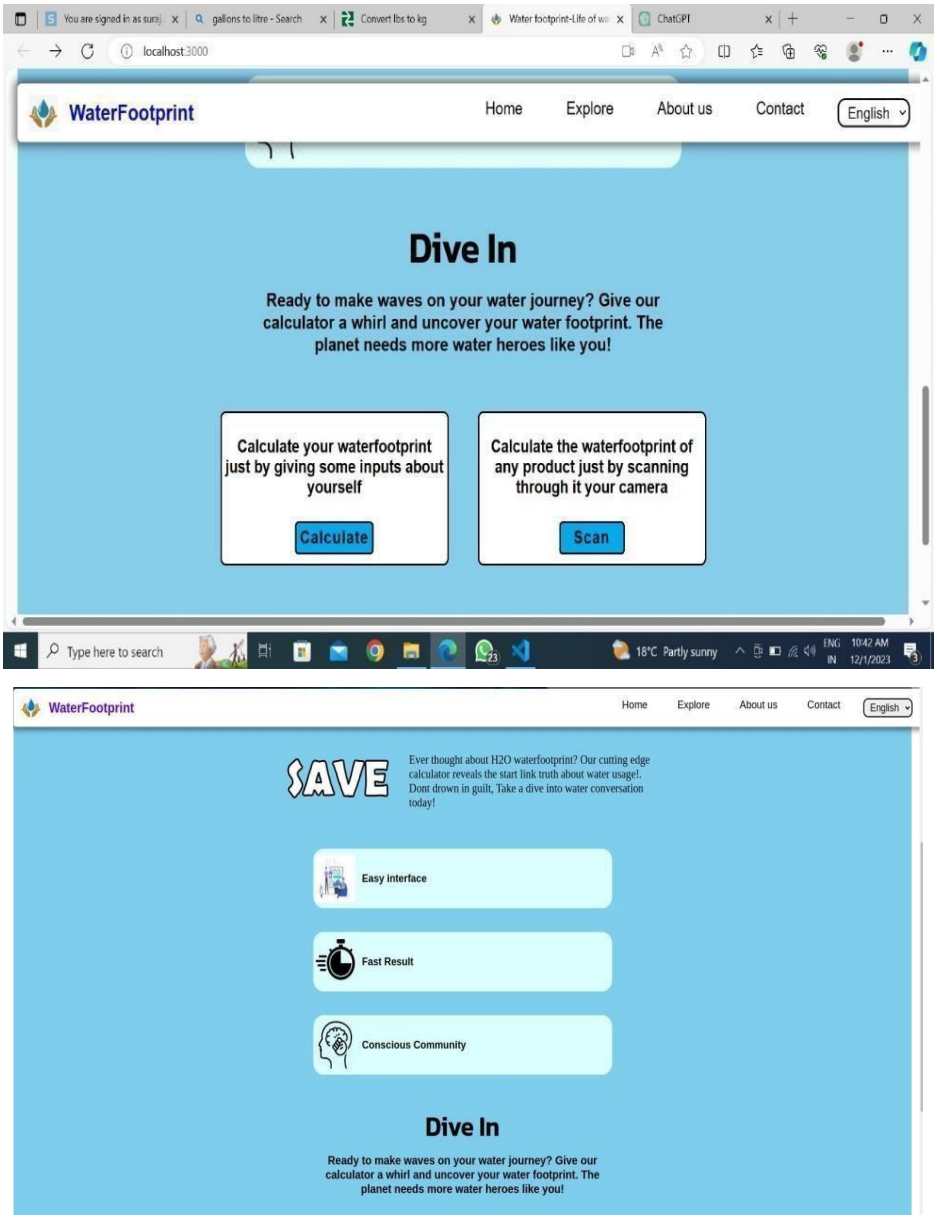
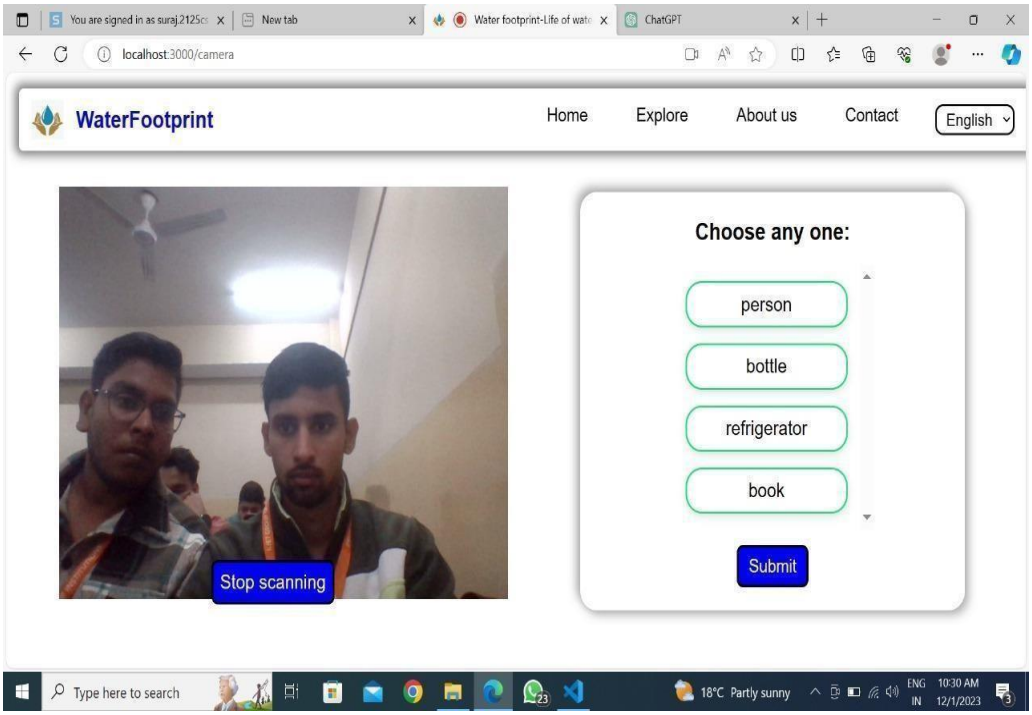


Figure 7.1 Water FootPrint Website



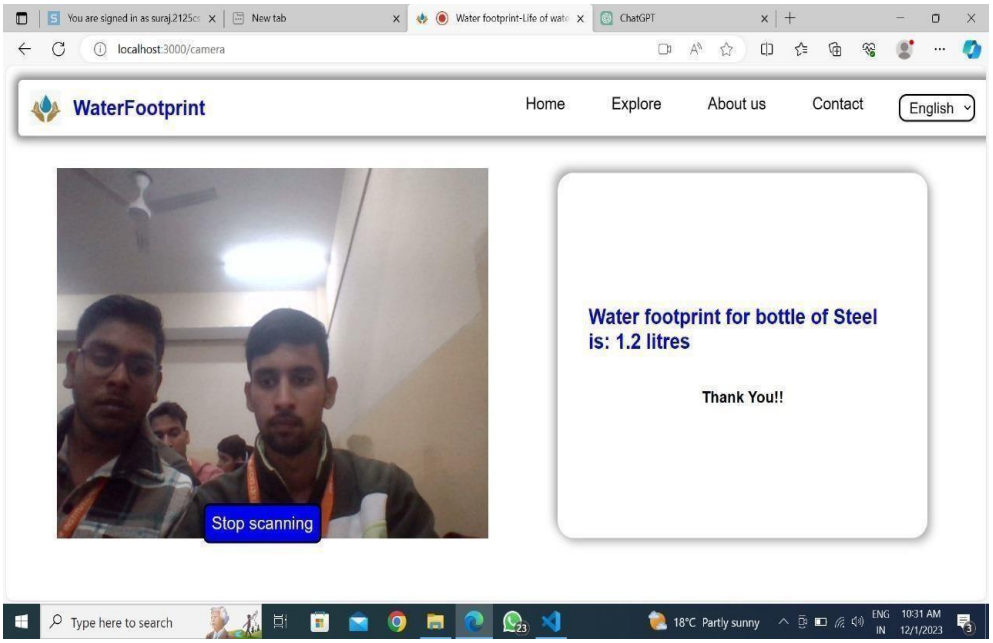


Figure 7.2 Demonstration Diagram

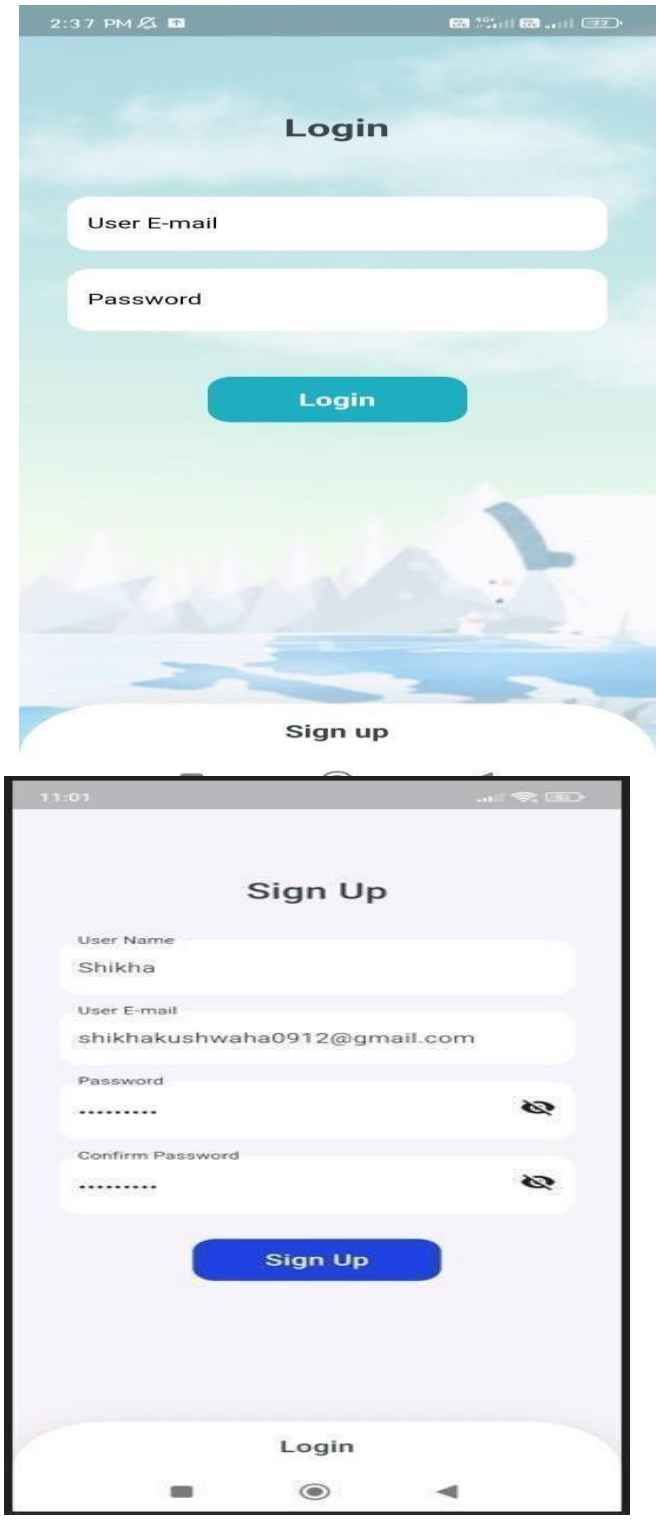


Figure 7.3 App Interface

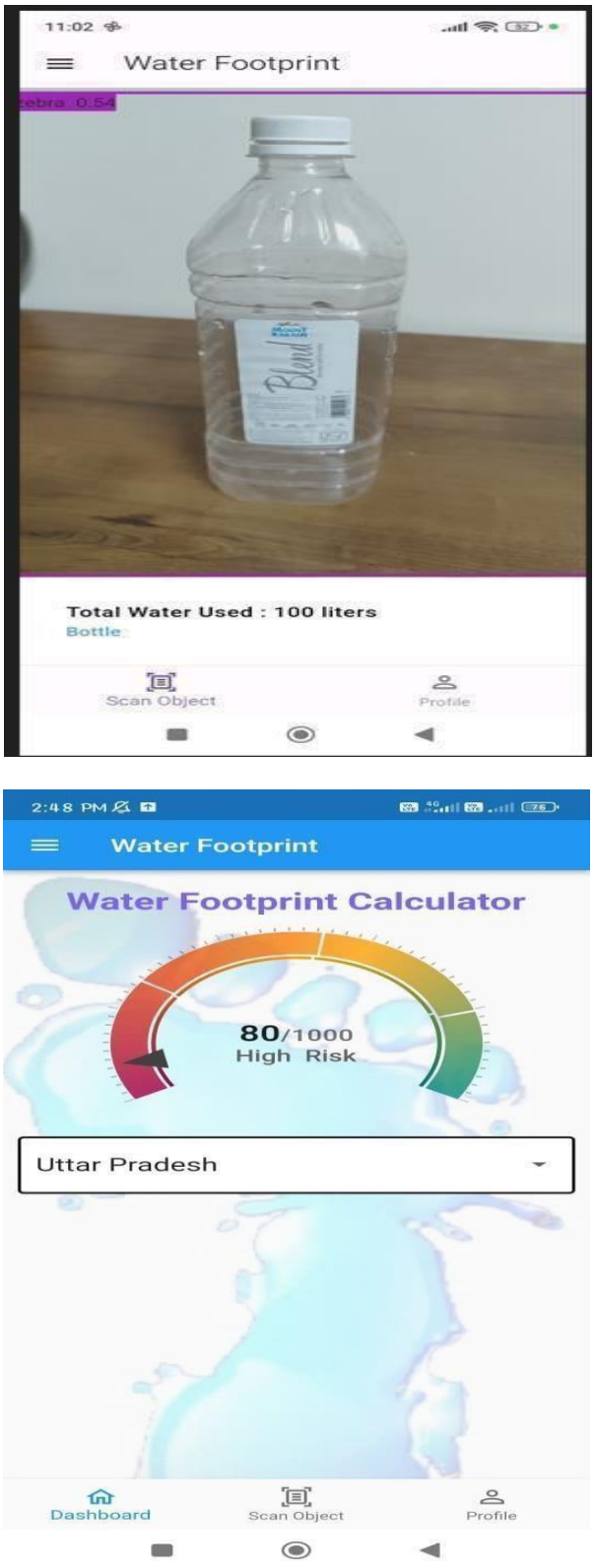


Figure 7.4 App Demonstration Diagram

7.2 OUTPUT AND SUGGESTIONS

A. Understanding Water Use in LocalContexts Volumetric Water Footprints (WFs) are of great concern to evaluate the effectiveness and effects of water usage whilst considering region specific information. This means using the amount of water used to that which is supplied in that area of the world. WFscan becompared to total water resource which has been established by various studies in the region and other research on the natural standards of the environment. Consequently if water use surpasses water availability it results in water shortage. What is more, it sometimes pollutes water, which affects both water systems and people's health when the level of pollution becomes intolerable. On a global scale, Four billion individuals suffer from blue water scarcity, or the absence of freshwater, on a monthly basis, at minimum. Around 50 percent of global green water is being over exploited; plants and other vegetation are using more water than is available through the rains and which is retained by the soil. Increased pollution of the water is making the various sub catchment areas to be polluted by things like fertilizer and other materials affecting the water quality. Water Footprint assessments assist us in seeing what human activities are causing these issues to occur. These data can be applied in an attempt to avoid wastage and pollution of water because it assists those in production, using water and those in leadership to formulate strategies that would enable them control water use.

B. GlobalDimension ofWater UseandVirtualWater Trade Virtual water includes the unseen water content of products and services which are imported and exported between countries. This idea overarches the way water is employed in Fig. 4.1 The HiddenWater In Trade manufacturing activities where goods are imported or exported across the globe tying nations together through complex value webs. Virtual water exchange is a vital tool in the water scarcity mitigation because it enables water-short countries to import water in water-intensive commodities brought in from countries with more water availability. For instance, countries that have surplus water availability in making food crops such as Brazil, the United States send water intensive products such as grains and cotton to arid regions of the world such as Saudi Arabia and Kuwait. This trade enables water-short areas stay fed and industrialized without using up their water, in essence outsourcing water use in water- endowed areas.

C. Strategies to Reduce WaterFootprints Here are some possible measures to decrease water consumption in various domains: These strategies help conserve water and promote more sustainable practices:

1) Irrigation Efficiency: Irrigation water in farming can be managed well through better methods of irrigation. For instance, with the drip irrigation system, water is relayed directly to the root area, thus minimizing the use of water. Subsurface irrigation involves placing water below the ground, while deficit irrigation involves applying less water at a time when it is possible to get less water[10], but plants continue to grow fine. A layer of mulch acts as a reservoir of moisture, thus minimizing the time required for watering.

2) Water Conservation Measures: Water conservation involves various strategies to reduce overall water consumption, such as improving rainwater harvesting, managing watersheds better, and cultivating drought- tolerant crops.

3) Industrial Water: Instead of being wasted, water in industries can be recycled and used again. The total water footprint of production can be decreased by reducing back on water-intensive industrial activities.

4) Consumption Shift: Water use can be minimised through encouraging consumers to pick less water-intensive items, such as plant-based diets rather than meat. This can be accomplished by encouraging sustainable dietary modifications and running awareness campaigns.

5) Water Pricing and Rights: Governments are able to encourage businesses and individuals to utilise water more efficiently by enacting water tariffs. Better distribution and use of water resources according to demands are made possible by water rights and water markets.

6) International Trade: Water-intensive crops and products can be imported by countries experiencing water scarcity from areas with greater water availability. This prevents overuse of water resources and helps lower local water demand.For example,due to its arid climate and scarcity of freshwater resources, the Middle East and North Africa (MENA) area is mostly dependent on virtual water imports to meet its food security requirements. For example, water-rich nations like the United States and Canada supply Saudi Arabia and other countries with significant amounts of wheat and other cereals. Saudi Arabia saves its limited freshwater resources by importing wheat, which requires a lot of water to grow

D. Impact on Consumer Behavior and Lifestyles Global water dependencies are created when people's consumption patterns transfer the cost of water use to other nations. This implies that the water used to manufacture the things that people in one country consume frequently originates from other areas, sometimes from areas that are already experiencing water scarcity.

1) Externalized Water Footprints : The water footprint of consumers in affluent nations is "externalised" to other nations to a significant extent. For instance:The water footprint of Dutch consumers is 95Water-constrained areas account for about half of this footprint, where water resources are already scarce.

2) Global Water Dependencies : Countries indirectly rely on the water resources of exporting nations when they buy water-intensive commodities like meat, cotton, or coffee. Since

more water is used to produce things for export rather than for local consumption, this could make the water shortage in those areas worse.

E. Policy Framework and Initiatives: Strong legislative frameworks and focused programs are necessary for sustainable water management in order to tackle the problems of water scarcity and mismanagement. For instance, the National Water Policy of India, which was originally presented in 1987 and updated in 2002 and 2012, places a strong emphasis on environmentally sustainable practices, equitable distribution, and effective water use. In order to guarantee sustainable use of water resources, the policy highlights the necessity of demand-side management, conservation techniques, and integrated water resource management. To help achieve these objectives, a number of significant projects have been started. The National Water Mission emphasises the value of conserving water and reducing waste while concentrating on the fair allocation of water resources. A groundwater management program called the Atal Bhujal Yojana seeks to raise groundwater levels by encouraging sustainable practices and community involvement. Additionally, by encouraging micro- irrigation methods like drip and sprinkler systems, the Pradhan Mantri Krishi Sinchayee Yojana aims to improve agricultural water-use efficiency. Together, these policies and programs provide a comprehensive framework to address the complexities of water management. They promote an integrated approach that includes resource conservation, community engagement, and technological advancements to meet present and future water demands sustainably.

F. Pollution Control ThroughWater Footprint Assessment (WFA) One of the most important tools for controlling and reducing water pollution is the Water Footprint Assessment (WFA). It aids in measuring the ”grey water footprint,” or the amount of water needed to get pollutants down to acceptable levels. Through the identification of pollution hotspots—areas with the highest levels of contamination—WFA helps industry

CHAPTER 8
CONCLUSION AND FUTURE SCOPE

8.1 Conclusion

The creation of a Water Footprint Calculator app builds an essential foundation to tackle water footprint increases and promote sustainable water resource governance. Digital technology combined with this novel solution enables users to obtain easy access to water usage data about different goods and services. Users can protect freshwater supplies by making educated choices while practicing sustainable behaviors through this program which leads to active conservation efforts against water depletion and reduction of water contamination.

The data accessibility features and water management support capabilities through the app demonstrate potential systems-changing capabilities that promote collaboration between stakeholders. The Water Footprint Calculator app maintains its value as a crucial component for our unified work to create a sustainable and resilient future while we deal with environmental and social and economic elements that determine water security. The combination of technology with individual and collective action will lead us toward a future where freshwater resources receive proper judicial and equitable management to benefit current and future generations

8.2 FUTURE SCOPE

1. **AI-Powered Water Usage Prediction** – Implement machine learning models to predict future water consumption trends and provide recommendations for conservation.

2. **Blockchain-Based Water Transparency** – An implement of blockchain technology enables tamper- proof recording for H2O footprints which allows verifications of sustainability claims.

3. **Gamification for User Engagement** – Providing rewards together with leaderboards along with challenges should motivate people to reduce their water consumption.

4. **AR-Based Water Footprint Visualization** – Users should be able to activate an augmented reality function showing water usage data directly on their item scans for improved understanding.

5. **Integration with Government Databases** – Work with environmental agencies to acquire official water usage data that will enhance accuracy levels.

6. **Automated Water-Saving Tips** – The system should supply recommendations from AI models which adapt to a person's habits to minimize their water usage at home and in industrial processes.

7. **Multilingual Support for Global Reach** – The system should supply recommendations from AI models which adapt to a person's habits to minimize their water usage at home and in industrial processes.

8. **Community-Driven Reporting System** – Users should get the chance to indicate water-intensive business sectors and geographic areas for policymakers to obtain community-generated intelligence.

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