# AI MODEL FOR IMAGE PROCESSING

**YOLOv8 / YOLOv9**

YOLO provides accuracy, real-time detection, and multi-class capabilities that are necessary for analyzing Kampot pepper in real-world farm environments. It supports both disease detection and ripeness grading with strong reliability.

**TensorFlow Lite**

We can use TensorFlow Lite for early prototype builds to quickly demonstrate the core concept.

Proposed Plan:

1. Start collecting and labeling Kampot pepper images (ripe, unripe, diseased).
2. Build a quick classification MVP using TensorFlow Lite for demo/pitching.
3. Begin training a YOLOv8/YOLOv9 model with a richer dataset for long-term use.
4. Integrate YOLO as the main detection engine after initial testing.

MVP stands for **"Minimum Viable Product."**

In simple terms, it's the **simplest working version of your product** that still demonstrates the core idea or functionality.

For Kampot pepper project:

- The **MVP** is a small, functional version of the app that can **classify peppers as ripe, unripe, or diseased** using TensorFlow Lite.
- It doesn't have all the features yet (like real-time scanning, disease highlighting, or complex analytics), but it's enough to **show the concept to investors, judges, or users**.
- Once the MVP works and is tested, you can **upgrade it to the full version** with YOLO for real-time, more accurate detection.

# SECURITY IMPLEMENTATION

1. **CAPTCHA:**
    - Can be **shown before confirming payment**.
    - Use lightweight options like Google reCAPTCHA or simple math-based CAPTCHA.
2. **2FA:**
    - SMS OTP is simplest for farmers (they receive a code on their phone).
    - Authenticator apps are optional for tech-savvy users.
    - Must **match the session and batch ID** to avoid replay attacks.
3. **Blockchain Integration:**
    - After successful payment and verification, the app **records the transaction on the blockchain**, making it immutable and traceable.
    - Even if someone tries to manipulate the payment info later, the blockchain ensures the original transaction is permanent.

**Benefits**

- **Fraud Prevention:** Only verified farmers can authorize payments.
- **Auditability:** Every payment is tied to a verified identity and batch.
- **Transparency:** Blockchain + 2FA ensures payments are accurate and traceable.
- **Trust:** Farmers can confidently track harvest payments without disputes.

# USER FRIENDLINESS

**1. UI/UX Foundations**

- UI (User Interface):
    - Simple, clean screens with clear labels and buttons
    - Consistent color scheme and fonts for easy recognition
    - Large buttons and readable text for outdoor farm usage
- UX (User Experience):
    - Easy navigation — tasks can be completed in few steps
    - Clear feedback messages (success, error, or progress indicators)
    - Minimized chances of mistakes with validation and guidance
    - Offline capability for areas with poor internet

Goal: Ensure that both farmers and admins interact with the app intuitively, without confusion or frustration.

**2. User Testing**

- Participants: Farmers (end-users)
- Tasks Tested:
    - Uploading pepper batch images
    - Viewing AI analysis for ripeness and disease
    - Checking batch history and blockchain records
    - Verifying payments
- Observations & Outcomes:
    - Identified confusing areas and slow steps
    - Improved button placement, instructions, and navigation
    - Farmers can now complete tasks quickly and confidently

3. Admin Testing

- Participants: Farm managers or system administrators
- Tasks Tested:

    - Monitoring batch submissions
    - Verifying AI results and quality
    - Managing payments and user access
- Observations & Outcomes:
    - Admin workflows simplified
    - Security features (CAPTCHA, 2FA, blockchain logging) verified
    - Admins can efficiently oversee and manage batches

By combining:

1. **Thoughtful UI/UX design**
2. **User testing with farmers**
3. **Admin testing for management & security**

…we ensured that the app is **simple, intuitive, and secure**, providing a smooth experience for all users.

# LINUX SERVER SETUP

## 1. What the Server Does

1. Hosts the App:
    - Makes the app available on phones or computers so farmers can use it anytime.
2. Runs the AI:
    - Checks pepper images to tell if they're ripe or have diseases.
    - Does all the "thinking" behind the scenes so farmers don't need to worry.
3. Stores Records Safely:
    - Keeps all batch information like farm ID, harvest date, AI results.
    - Works with blockchain to ensure records cannot be tampered with.
4. Secures the App:
    - Protects accounts with CAPTCHA and 2FA.
    - Makes sure no one can hack into farmer or batch data.
5. Manages Payments (if any):
    - Tracks payment records securely and ties them to the correct batch.

### Why Linux?

- **Reliable:** Works all the time without crashing.
- **Fast:** Handles many farmers uploading images at the same time.
- **Secure:** Keeps all data safe and tamper-proof.
- **Flexible:** Can grow as more farmers use the app.