HOW IOT AND AI CAN IMPROVE MICROGREENS FARMING AND SUSTAINABILITY.

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WHY DO WE NEED SMART FARMING?

- Urban food demand for more nutritious and fresh produce are growing.

- Traditional methods uses more resources like water, energy, harsh chemicals and space15+ years in tech innovation

- Microgreens are hard to scale manually

- By using the smart, clean and efficient systems we can produce microgreens which are much helathier.

WHAT ARE MICORGREENS ?

Tiny Plants, Big Benefits

- Harvested in 7–14 days 🌱
- Up to **40x nutrients** vs mature veggies
- Require less space & water
- Perfect for cities, balconies, and
- small kitchens

Shapiro et al, 2006 (1)

20oz. Broccoli = BroccoSprouts® 1oz. Broccoli Sprouts

Parameters/Features	Sprouts	Microgreens	Baby greens	Mature counterparts
Identification				
Growing duration	2 to 7 Days	7 to 21 Days	14 to 28 Days	28 to 84 Days
Harvesting stage	Germination stage (harvested as seedlings)	Cotyledon leaves (harvested above growing medium)	Young leaves (harvested as young leaves)	Fully developed (harvested as a mature stage)
Growing medium	Soilless (water)	Soil, cocopeat, hydroponics, and growing pads/mats	Soil and hydroponics	Soil
Pesticides and fertilizer	No need (pesticides and fertilizer residues absent)	No need (pesticides and fertilizer residues absent)	Need for during plant development stage (pesticides and fertilizer residues present)	Need for during plant development stage (pesticides and fertilizer residues present)
Plants part used	Seed and roots	Leaves and stems	Leaves and stems	Full mature parts
Flavor and texture	Mild flavor and tender texture	Intense flavor and tender texture	Mild to moderate flavor and tender texture	Moderate to strong flavor and firm texture
Storage life	Short duration shelf life	Short duration shelf life	Longer shelf life	Longer shelf life
Culinary use	Sandwiches, salads, toppings and stir-fries	Sandwiches, salads, smoothies, and garnishes	Sandwiches, wraps and salads	Salads, cooking
Nutritional profile	Nutrient-dense, rich in vitamins and enzymes	High amount of vitamins, minerals, and antioxidants compounds	High amount of nutrients, vitamins, and minerals	Lower amount of vitamins and minerals compared to microgreens

RESEARCH QUESTION

What I'm Exploring

- Can IoT/AI improve microgreen **nutrition and yield**?
- Can they reduce **waste and disease**?
- Will farmers actually **adopt** this?


iStock
Credit: Khaosai Wongnatthakan

WHAT HOUSEHOLDS AND FARMERS THINK

- Survey: 20 urban farmers (tech use, barriers)

- Interviews: What works, what doesn't

- TPB Framework: How beliefs shape adoption

MY EXPERIMENTAL PLAN

- HOW I'M GOING TO TEST THE TECH

- **3 setups:** Traditional vs IoT vs AI-enhanced
- **Metrics:** Yield, nutrients, water use
- **Tools:** DHT22 sensor, LED grow light,
  Python decision tree
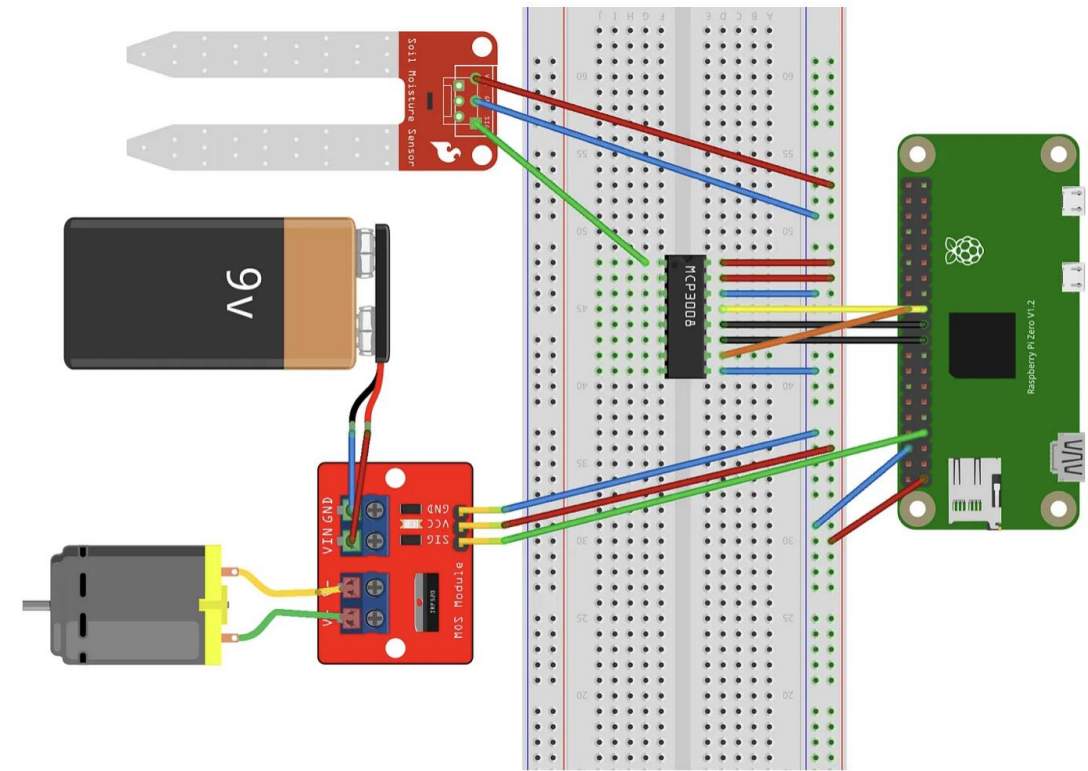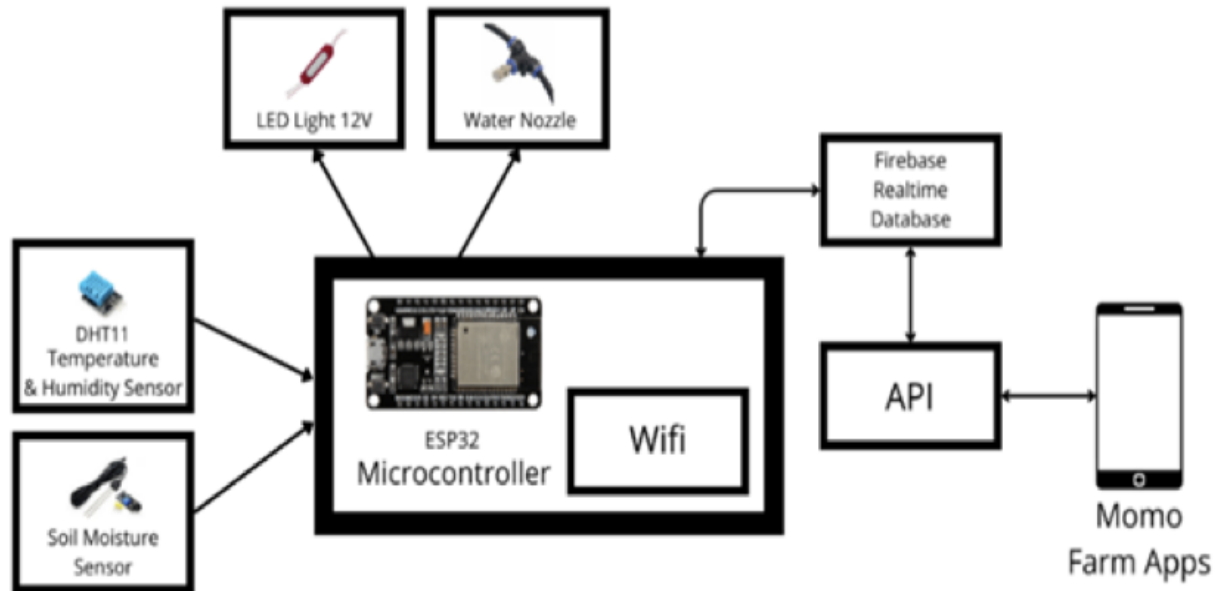
Electronic Circuit for Plant System (Made With Fritzing)

Fig. 2: Block Diagram of IoT-based Smart Vertical Farming Device

ANALYZING THE DATA

- Crunching the numbers

- **ANOVA:** Compare growth across setups
- **Regression:** Predict outcomes
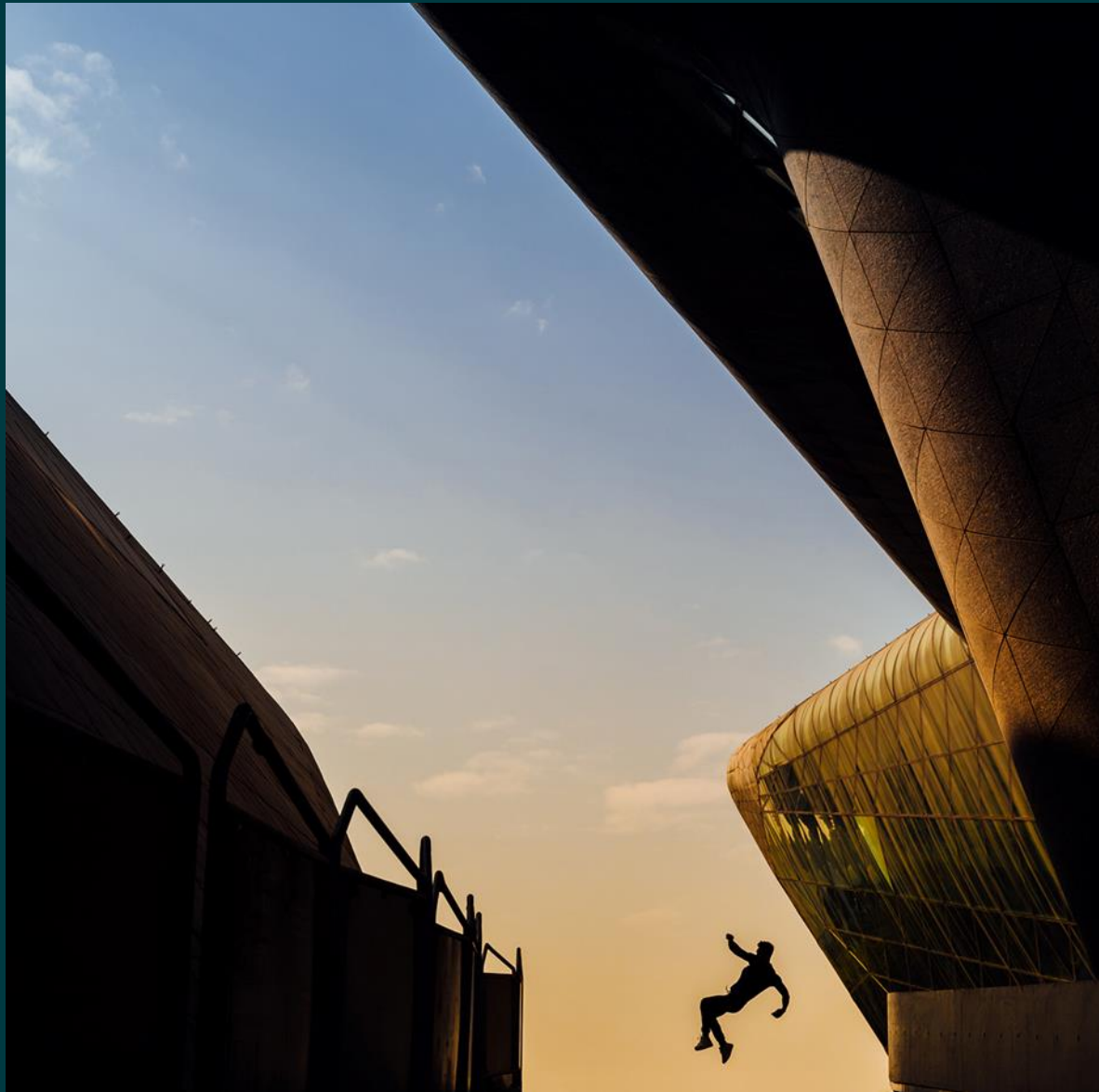- **NVivo:** Farmer quotes = themes

WHAT'S NEXT

- WHERE IT CAN GO

- Expand to more microgreen types
- Add blockchain for food traceability
- Make tech affordable for small growers
- Potential for **urban food security**

WHY THIS MATTERS

- SUSTAINABLE FOOD STARTS HERE

- Better food, less harm
- Smart tools for healthy cities
- Combining **tech + nature** for impact

THANK YOU &LET'S GROW TOGETHER

- Panel discussion session.