

COMMUNITY-LED INITIATIVES FOR POSTHARVEST MANAGEMENT OF FRUITS AND VALUE-ADDED PRODUCTS



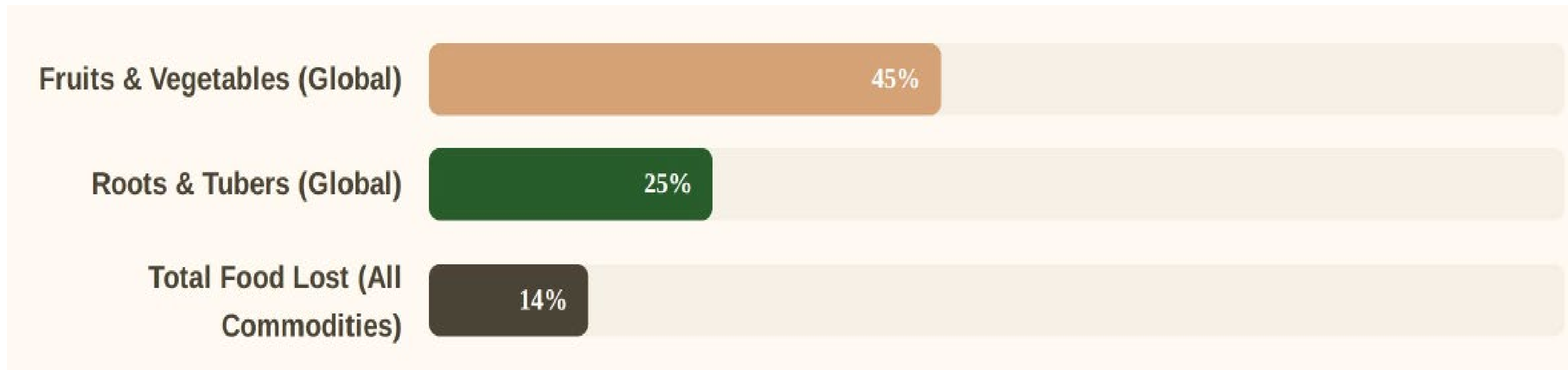
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The Challenge: A Global Perspective

Every year, a vast portion of our global food supply, especially perishable items like fruits and vegetables, is lost after harvest. This isn't just a waste of food; it's a critical loss of income, water, and labor for the world's smallholder farmers.

The Problem in Numbers: Global PHL



In developing countries, losses for fruits and vegetables can exceed 50%. This represents a catastrophic loss of income for smallholder farmers who are the backbone of the rural economy.

(Source: FAO, 2019)

Impact of Food Loss And Waste Reduction



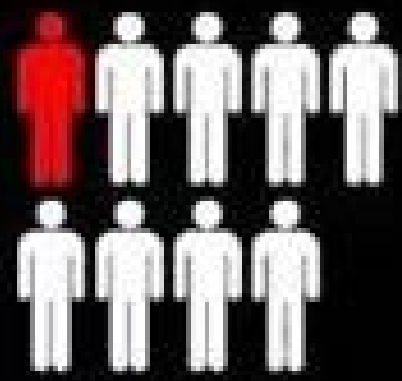
Negative Implications of FLW for Environment & Resources

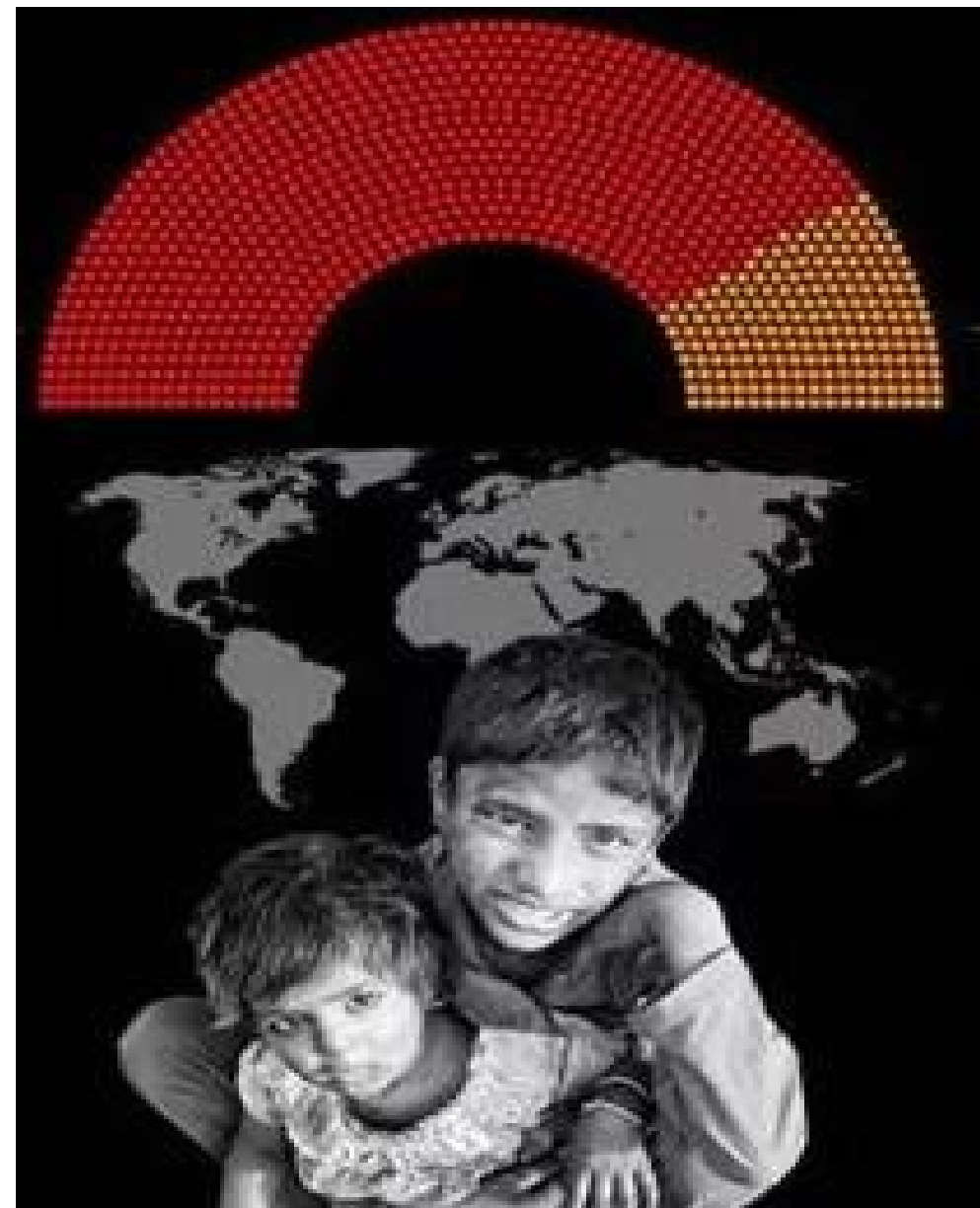
- ❖ Water scarcity
- ❖ Greenhouse gas (GHG) emissions
- ❖ Air and water pollution
- ❖ Biodiversity loss



Globally Hunger Problem

Globally
821 mn
People are affected
by hunger

THAT'S APPROXIMATELY

1/9
People



India
196 mn
People affected
by hunger

107
India's rank on the
Global Hunger Index*

Global Food Loss: Facts and Figures

- According to OECD-FAO, halving food loss and waste by 2030 could reduce global agricultural GHG emissions by 4% and decrease undernourishment by 153 million people.
- UNEP Food Waste Index (2021) stresses that preventing waste is more climate-friendly than recycling or disposal.
- World Resources Institute estimates (WRI, 2019) that halving food loss and waste, would cut emissions equal to removing 500 million cars from the road.
- Over a billion meals are wasted every day, representing about 20% of all food produced, costing approximately USD 1 trillion annually.
- Households account for around 60% of the waste, food services about 28%, and retail about 12%.

The Challenge: An Indian Perspective

- **India incurs food losses worth approximately ₹1.53 lakh crore (~USD 18.5 billion) annually.**
- **including losses of 12.5 million tonnes of cereals, 49.9 million tonnes of horticultural crops, oilseeds, and pulses.**
- **These losses are primarily due to inadequate cold chains and poor storage infrastructure.**
- **Indian households alone generate about 78.2 million tonnes of food waste per year, equating to 55 kg of waste per person annually — that's enough to feed 377 million people.**

Post-Harvest Loss: A Manageable Issue

- ❑ Post-Harvest Loss refers to the measurable decrease in food quantity and quality that occurs between the point of harvest and the point of consumption.

- ❑ For fruits and vegetables, this is a "**death by a thousand cuts**" caused by:
 - Physical damage (bruising, cutting)
 - Physiological decay (rotting, sprouting)
 - Poor handling and storage
 - Lack of cold chain

“WHY” Postharvest Management

“ Better postharvest management leads to better returns to growers, better fruit quality and increased production in subsequent years”

Tangible effects:

- **Reduction in losses.**
- **Availability of increased produce for increased demand.**
- **Better nutrition to people.**
- **Increased income to growers.**

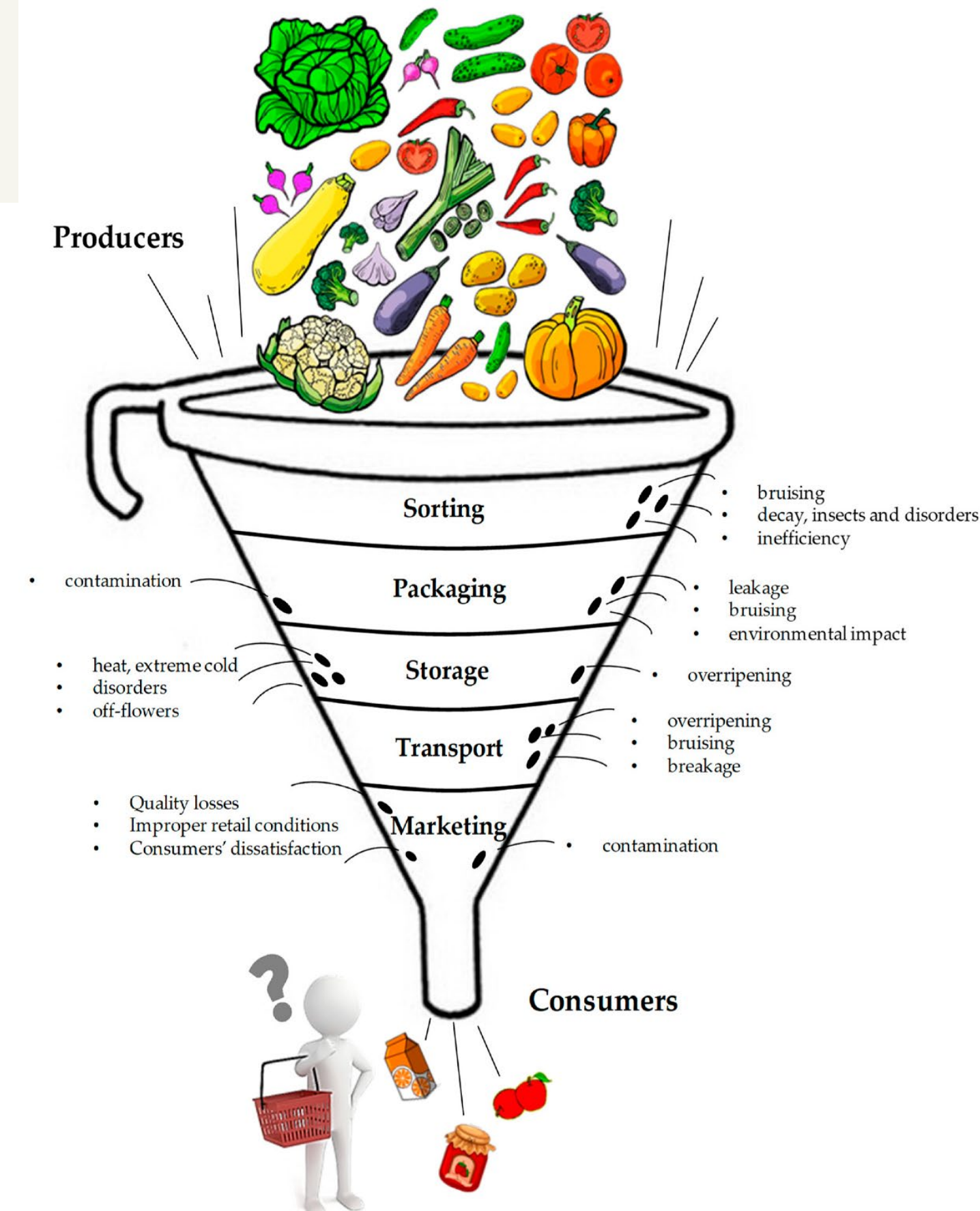
Core Concepts: Post-Harvest Management (PHM)

❖ **PHM refers to all the technologies and practices used to handle, store, and transport produce after it has been harvested. It is the first line of defense against loss.**

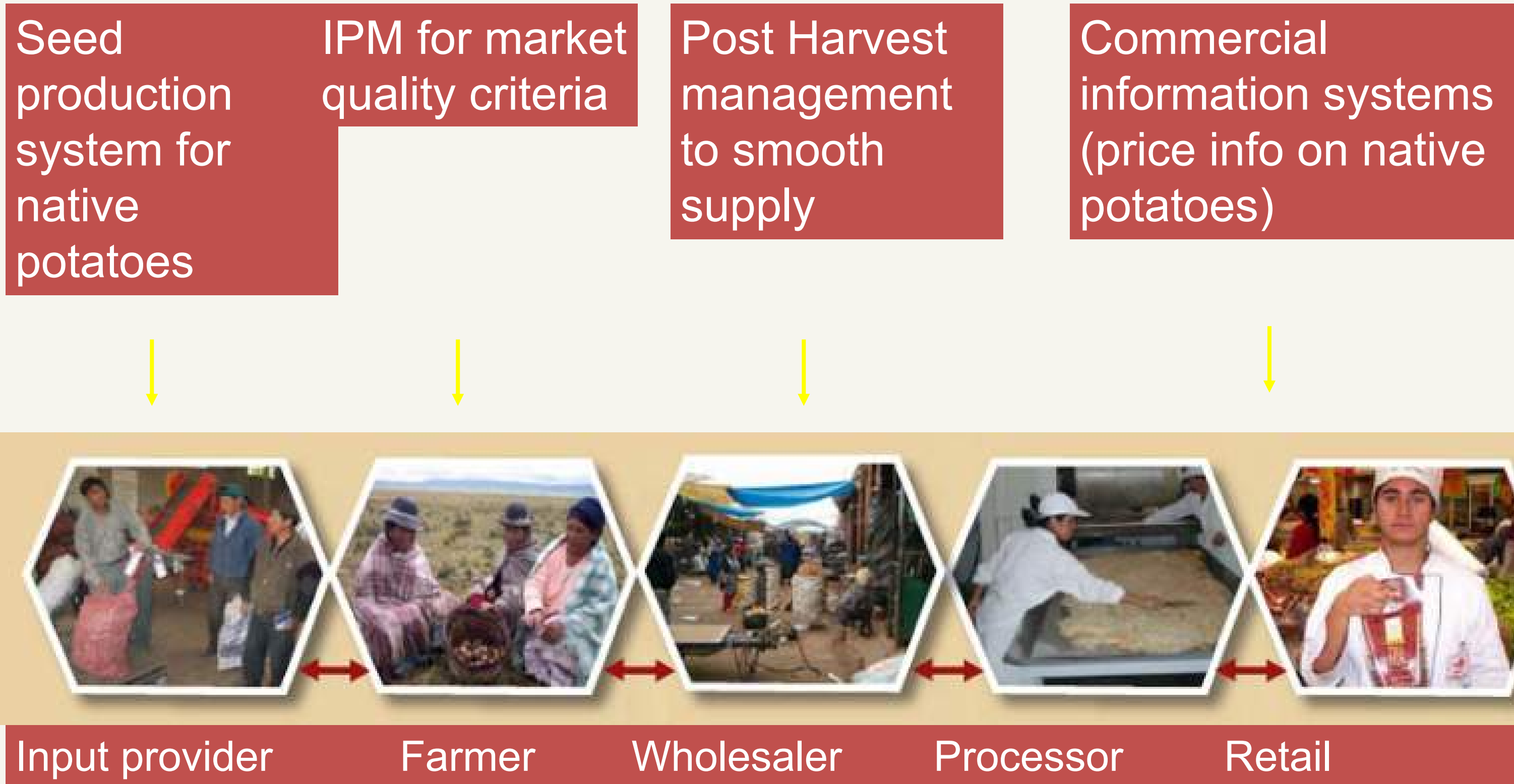
Key Activities

PHM is a system that includes:

- Gentle Harvesting: Using tools to avoid cuts.
- Sorting & Grading: Separating good vs. damaged, big vs. small.
- Cleaning & Curing: Removing dirt and preparing for storage.
- Proper Packaging: Using crates, not sacks.
- Cooling & Storage: Reducing temperature and respiration.



Innovation process > Commercial innovation through market chain is the driver for other innovations Links research and development



Core Concepts: Value Addition

□ **Value addition is the process of transforming a raw agricultural product into something new, giving it a higher market value, a longer shelf-life, and a new customer base.**

Examples

This process can range from simple to complex:

- Tomatoes → Tomato puree, Sun-dried Tomatoes
- Mangoes → Mango Jam, Dried Mango Slices, Juice
- Chilies → Chili Powder, Pickled Chilies
- Cassava → Cassava Flour (Atta), Chips



The Solution: A Community-Led Approach



- Top-down solutions often fail because they don't fit the local context.
- A community-led model empowers farmers to become "price-makers" instead of "price-takers."
- **Ownership:** Farmers own the solution, ensuring its long-term use.
- **Appropriate Tech:** Solutions are low-cost and manageable.
- **Collective Power:** Groups can buy supplies in bulk and sell in larger quantities.
- **Empowerment:** Profits are shared, often empowering women.

The Key Players: Models of Community Action

Self-Help Groups (SHGs)

Small, informal groups, typically of 10-20 women, who pool their savings. They are a powerful force for small-scale value addition.

Farmer Producer Organization (FPOs)

Formal, legal entities of farmers. FPOs act like a company, allowing them to aggregate produce, access finance, and build larger businesses.

Cooperatives

Democratically controlled businesses where members (the farmers) are also the owners and share in the profits and decision-making.

Part 1: Community-Led PHM

The First Line of Defense Against Loss

PHM in Practice: Low-Cost Storage Solutions

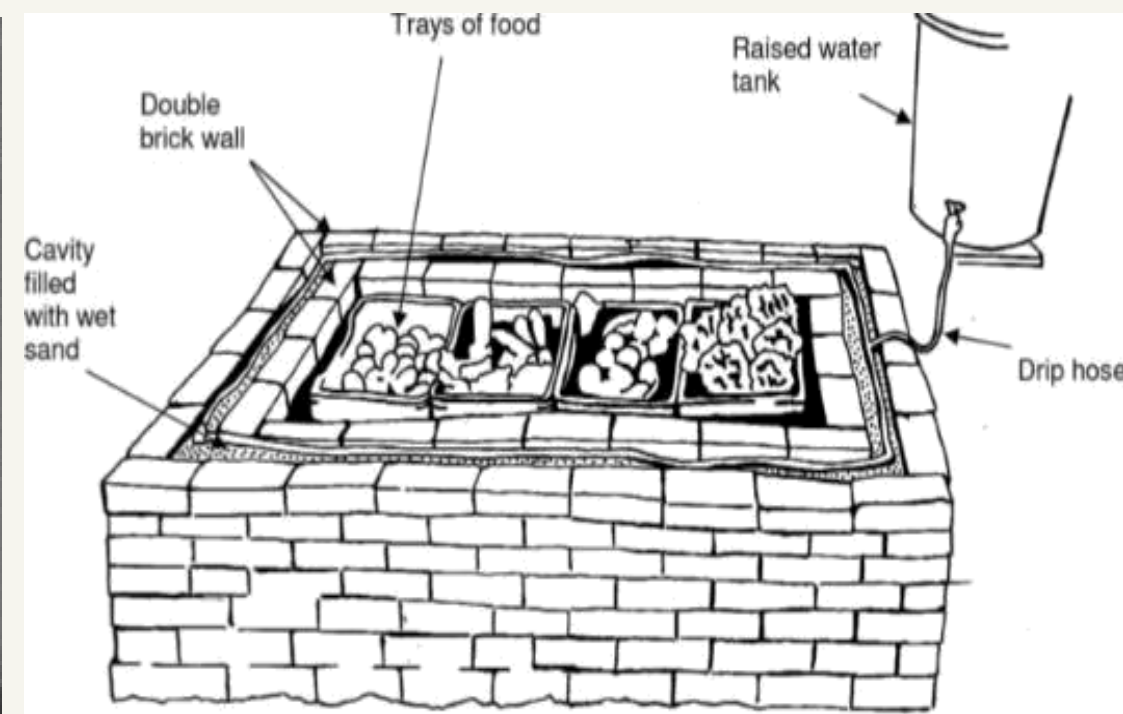
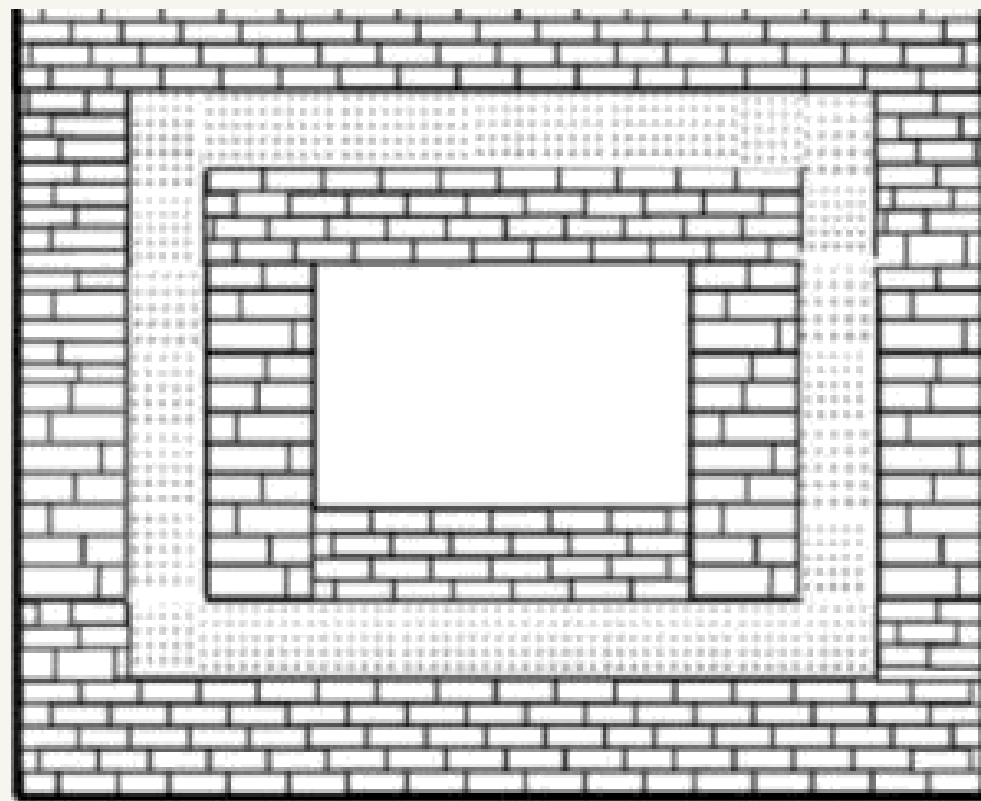
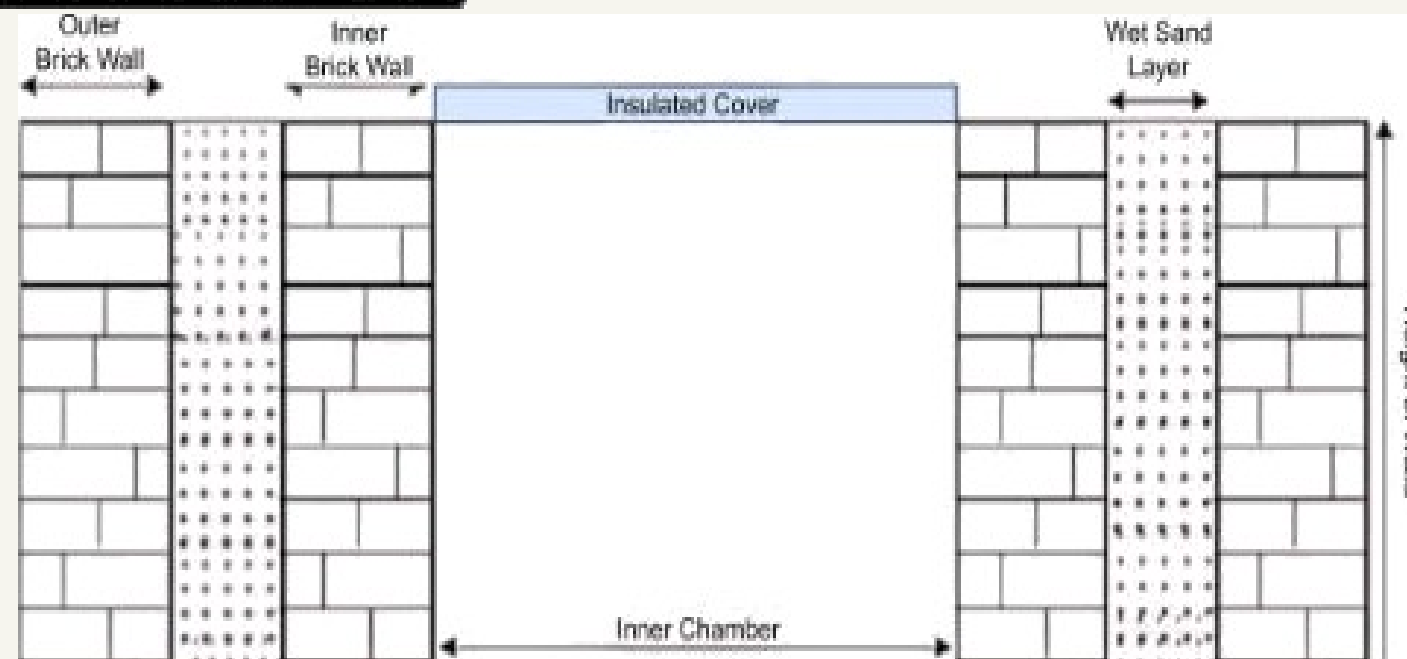


Figure 4: A static cooling system. Illustration: Practical Action / Neil Noble.



https://srrweb.cc.lehigh.edu/app/static/ZECC_5.png

Zero-Energy Cool Chamber

A simple, low-cost 'fridge' made of bricks and sand.

Evaporation keeps the internal temperature 10-15°C cooler, extending vegetable life by days.



Solar-Powered Cold Hubs

Communities manage walk-in cold rooms powered by solar panels.

Farmers can rent space for a small fee, allowing them to store produce and wait for better market prices.

PHM in Practice: Handling & Transport

Simple changes in how produce is handled can drastically reduce bruising, cutting, and contamination.

- **Plastic Crates:** Community groups often buy plastic crates to replace abrasive gunny sacks, which are a major source of damage.
- **Sorting Hubs:** A central, shaded area where members can sort and grade produce. This collective action builds a reputation for quality.
- **Refrigerated Vans:** FPOs can pool resources to lease a "reefer" van, essential for high-value perishables like berries or French beans.



Part 2: Community-Led Value Addition

From Perishable Problem to Profitable Product

Value Addition: A critical strategy

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The fresh market wants a perfect, grade-A product.

Value addition is for everything else.

— **A Smallholder Farmer's Reality**

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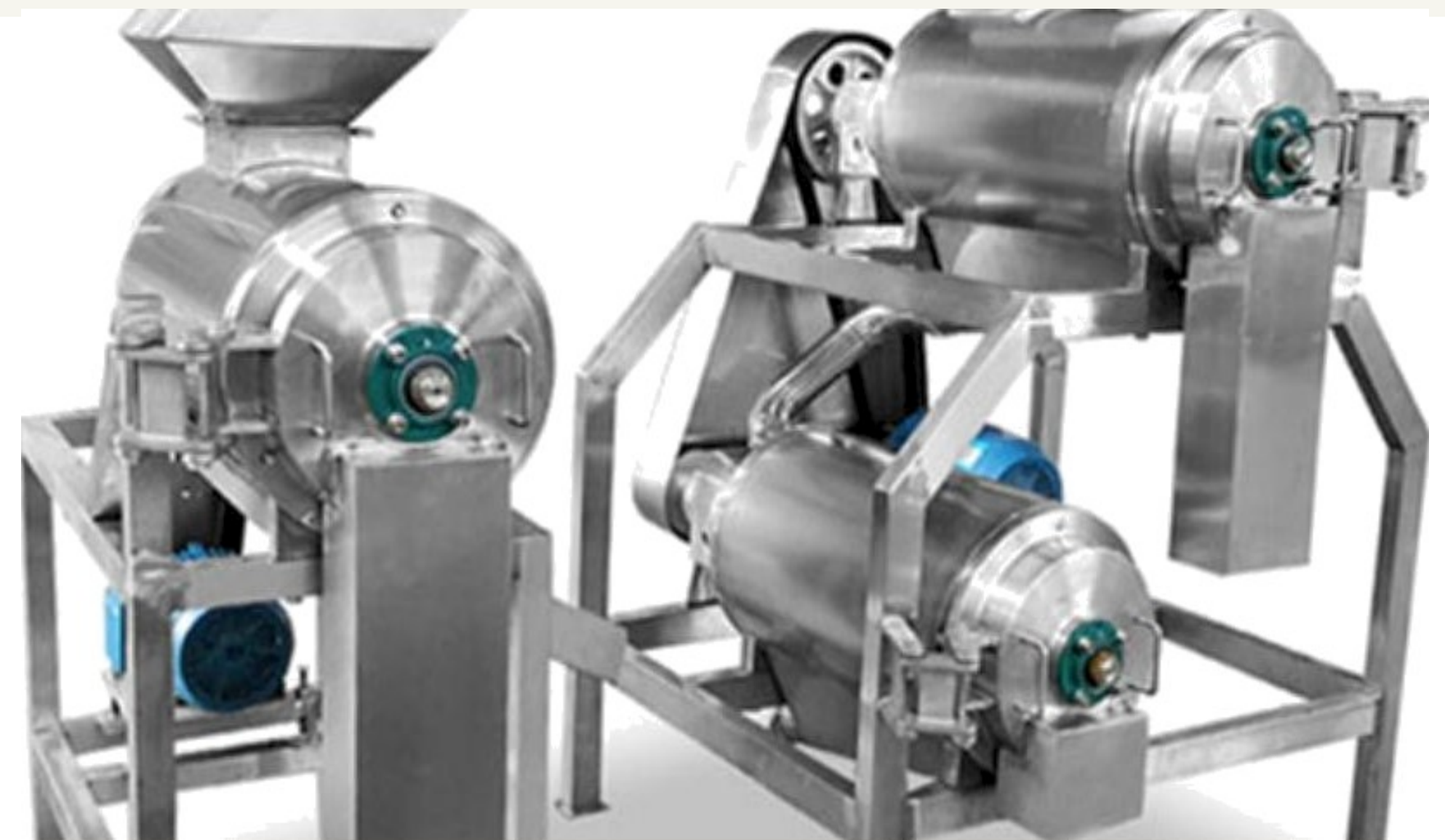
Value addition is a critical strategy to rescue "second-grade" produce (ugly, misshapen, or surplus) that is perfectly nutritious but has low market value. It converts this potential loss into a shelf-stable, high-income product.

Value Addition in Practice: Simple Processing



<https://image.made-in-china.com/202t0j00cOoibteCfBkt/Solar-Power-Dehydrator-Kish-Kruit-Kood-Dryer-Mango-Onion-Tomato-Drying-Machine.webp>

❖ Community solar dryers are cheap, hygienic, and efficient. They turn tomatoes, mangoes, bananas, and leafy greens into high-value dried products with a shelf life of months.



<https://turuimachinery.com/wp-content/uploads/2024/08/Kruit-Pulp-Making-Machines.jpg>

❖ Small-scale pulpers allow FPOs to process surplus fruit (like mangoes or tomatoes during a glut) into pulp, which can be sold in bulk to larger companies or used to make juices.

Value Addition in Practice: Building a Business

Pickles, Jams & Sauces

This is the most common entry point for SHGs.

Using local recipes, they turn excess produce into packaged goods like pickles, jams, and sauces.



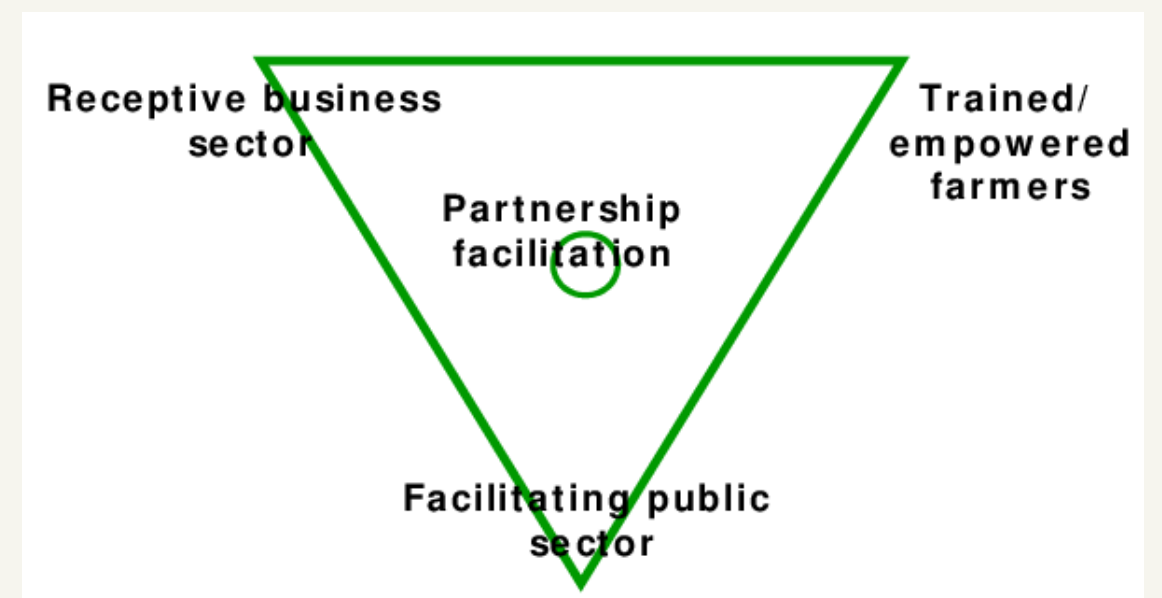
Branding & Packaging

The final step. Community groups create a local brand name, design simple labels (with nutritional info), and use FSSAI/local licenses to sell in retail markets.



Market Linkage

The group moves from selling in the local village to supplying district stores, online portals, and even export markets, cutting out the middlemen.



Part 3: Real-World Case Studies

Proof of Concept from the Field

Case Study 1: "Green Himalaya" SHG, India

Model: Women's Self-Help Group

In Uttarakhand, the "Green Himalaya" SHG, supported by NGOs, empowered local women to process fruits and vegetables that would otherwise be sold for low prices.

They now produce, package, and market a wide range of value-added products:

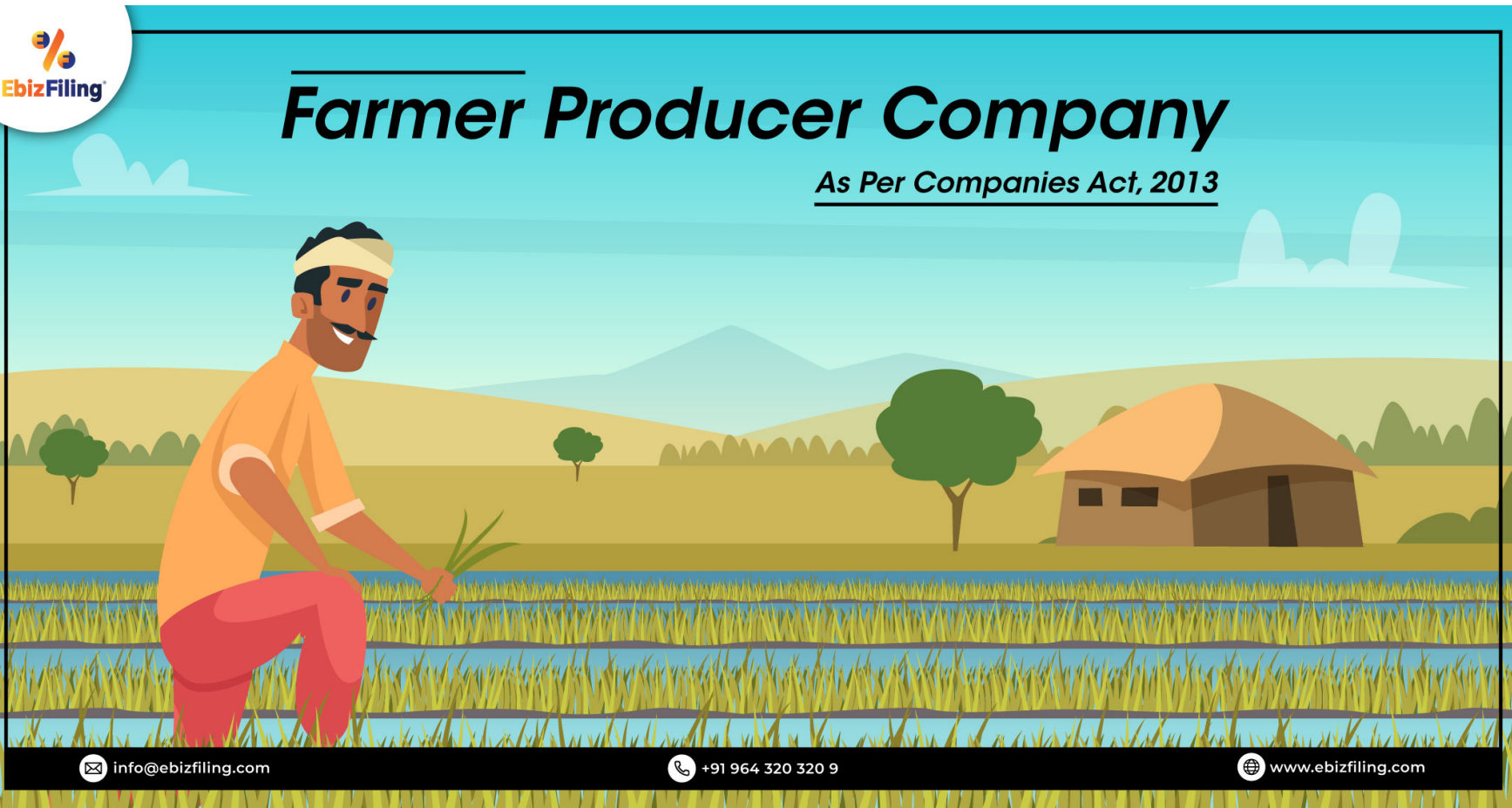
- Pickles (Garlic, Chili)
- Jams (Apple, Apricot)
- Juices & Squashes
- Aonla & Ginger Candies

Impact: This created sustainable livelihoods, empowered women socially and economically, and built a recognized local brand from farm surplus.



<https://jdews.org/wp-content/uploads/2023/08/p-1024x768.jpg>

Case Study 2: Telangana Mango FPOs, India



<https://ebizfiling.com/wp-content/uploads/2022/09/Karmer-Producer-Organization-as-per-Companies-Act-2013.jpg>

Model: SHGs scaling up to an FPO

In Telangana, women from SHGs in 94 villages formed FPOs to collectively manage their mango harvest.

Individually, they were forced to sell to middlemen at rock-bottom prices. As an FPO, they:

- Cut out the middlemen entirely.
- Aggregated their produce to sell in bulk.
- Trained in better packaging.
- Began marketing directly on e-commerce (online) portals.

Impact: This shift from individuals to a collective FPO gave them market power and significantly increased their income, all by managing their harvest as a community.

Case Study 3: Post-Harvest Training Centers, Africa

Model: Train-the-Trainer (Tanzania)

The Horticulture Innovation Lab established a Postharvest Training Center in Tanzania to create local experts.

Instead of just training farmers, they trained 36 local professionals, who then became community leaders.

- These 36 trainers, in turn, trained over ****7,400 farmers**** in their own countries (Tanzania, Rwanda, Kenya, etc.).
- They taught simple PHM tech: shade, better harvesting tools, sorting, and low-cost cooling (like CoolBots).

Impact: This "train-the-trainer" model builds lasting, local capacity. It's a community-led initiative for ***knowledge*** itself, which is the most sustainable tool.



Case Study 4: UNEP/ GEF project: Conservation and sustainable use of cultivated and wild tropical fruit diversity: promoting sustainable livelihoods, food security and ecosystem services



Chairperson of Klog Narai Co-operative at Chantaburi, Thailand

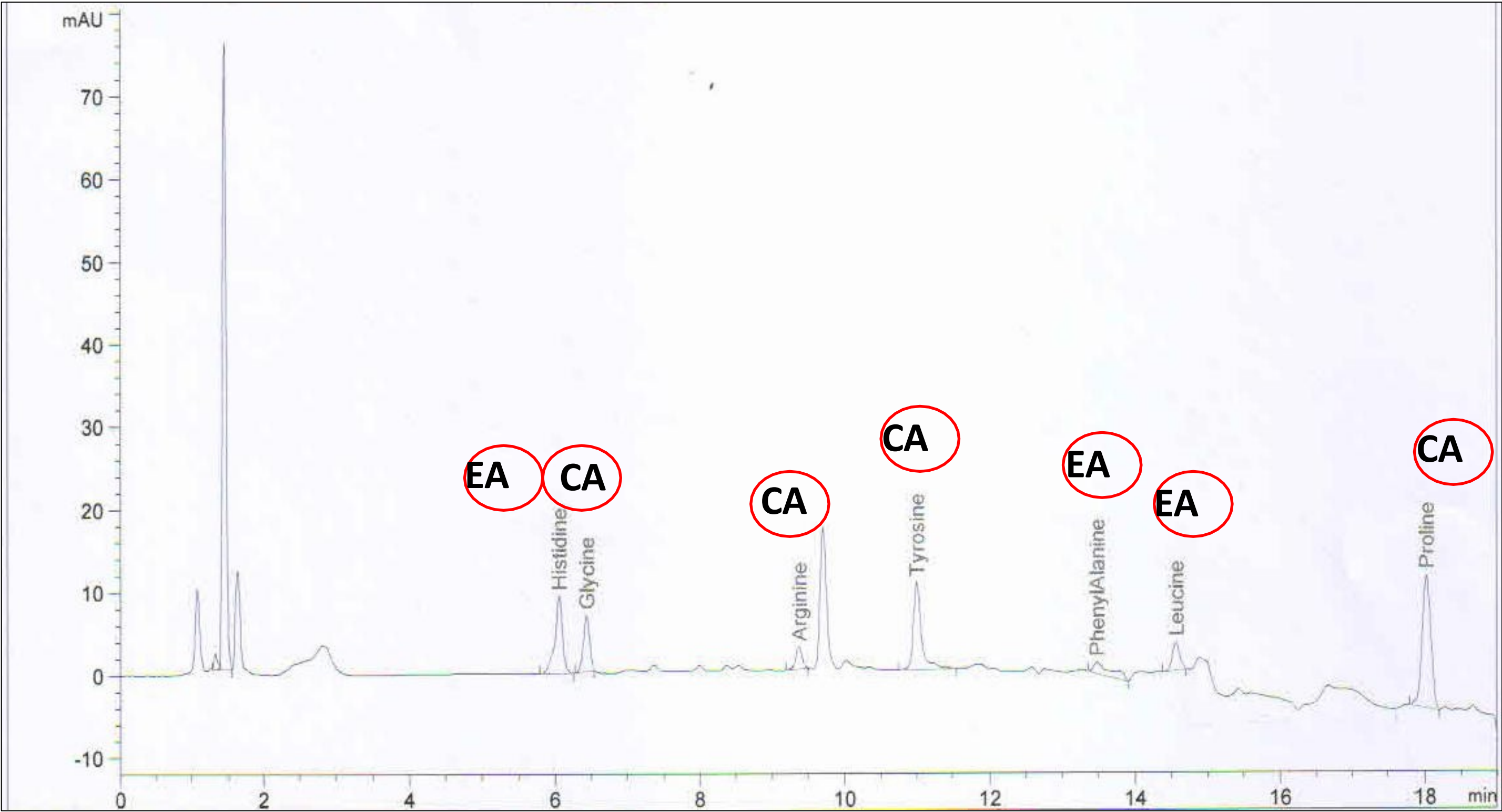
Product Diversification: A solution-oriented Approach



Citrus Biodiversity



Chromatogram of Amino acids in Citrumello



Flavonoid Glycosides

Flavonoid Glycosides

1. Flavanones (eg., Hesperidin,
Naringin, Naringenin)

2. Flavones (eg., Apigenin)

3. Flavonols (eg., Quercetin)

Hesperidin Market Global statistics

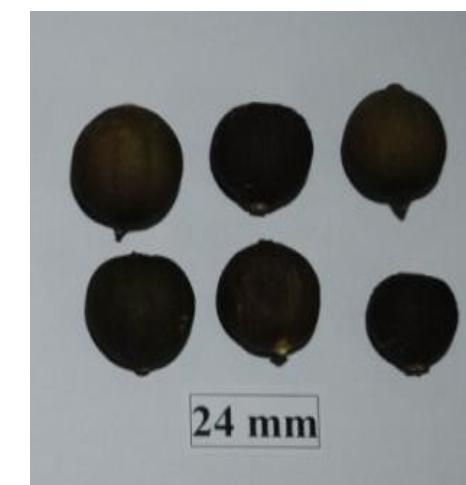
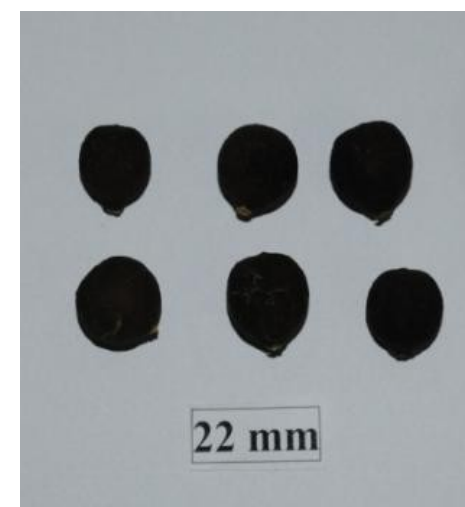
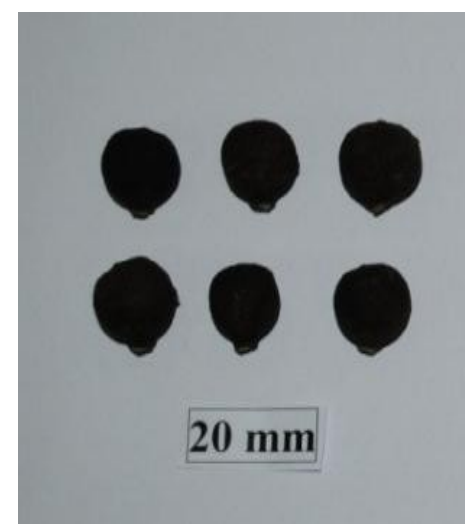
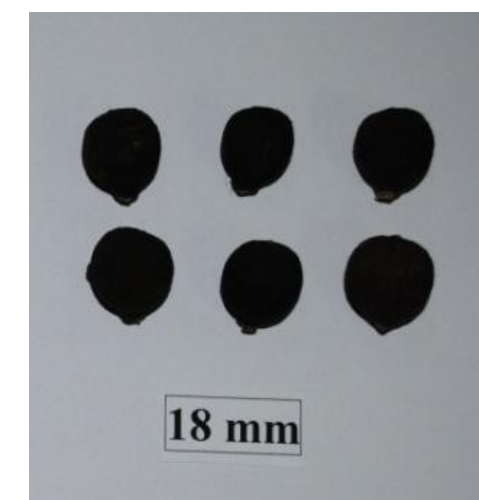
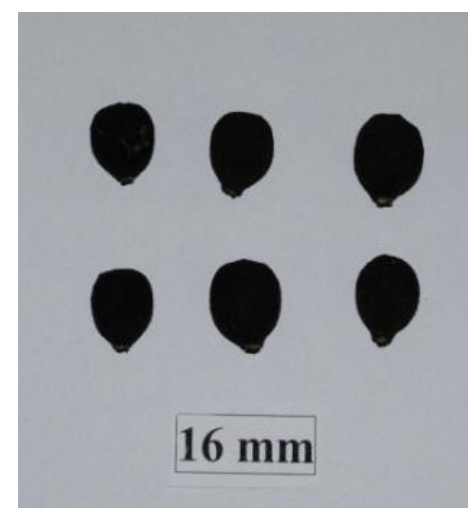
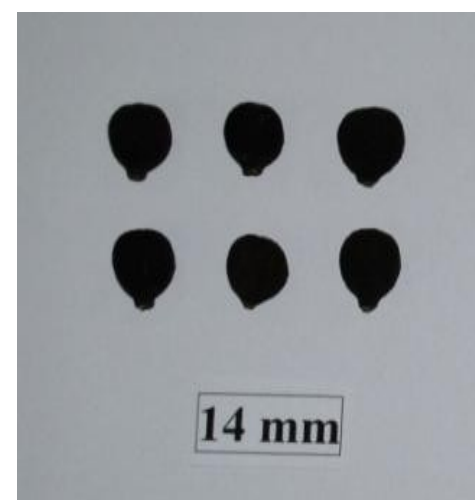
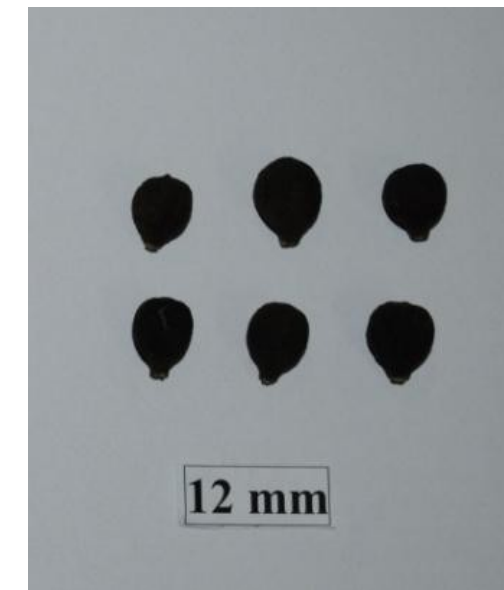
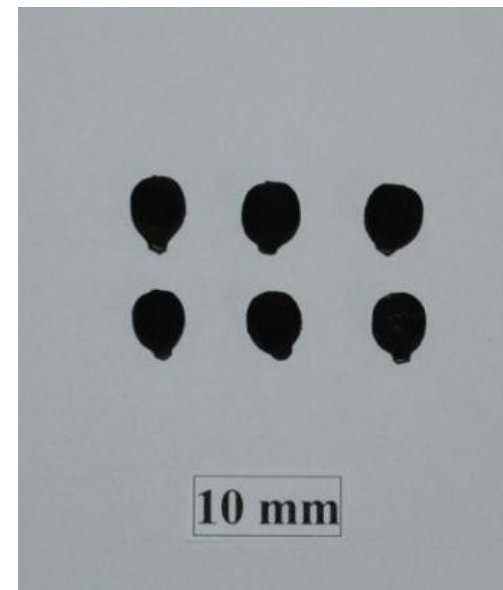
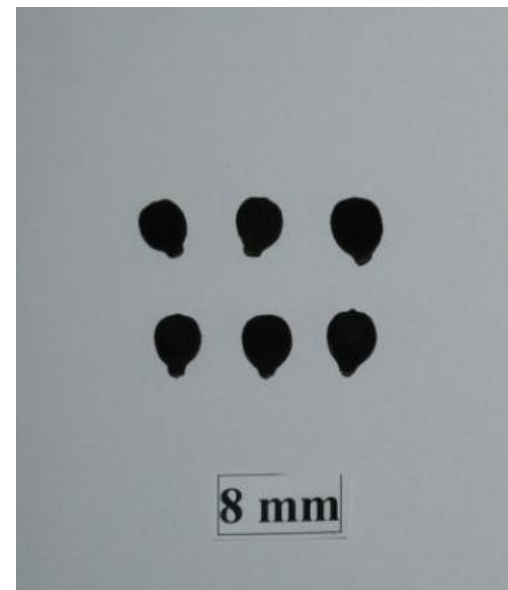
Health benefits of organic & green health ingredients will fuel the Hesperidin demand as a dietary supplement & functional ingredient.

2022	2032	CAGR 2022 - 2032
\$180.00 million	\$380.00 million	7.3 %

Source: Global market Insight (Published June 2023)

Utilization Of Dropped Immature Fruits

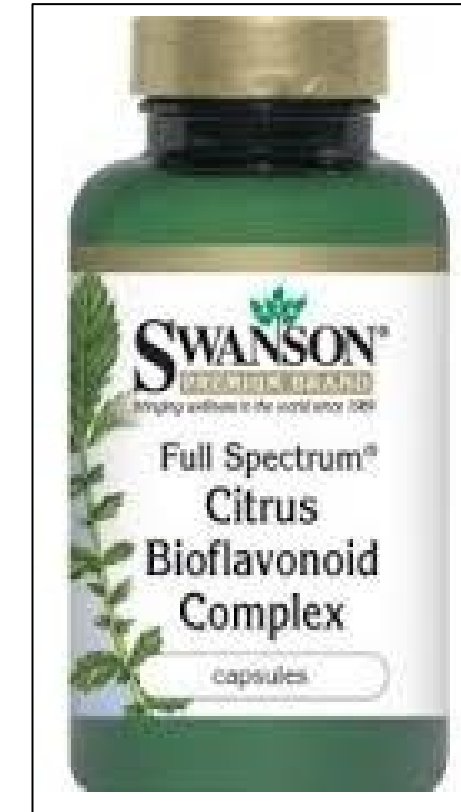
Generally regarded as waste and are discarded



Utilization of Physiologically dropped fruits

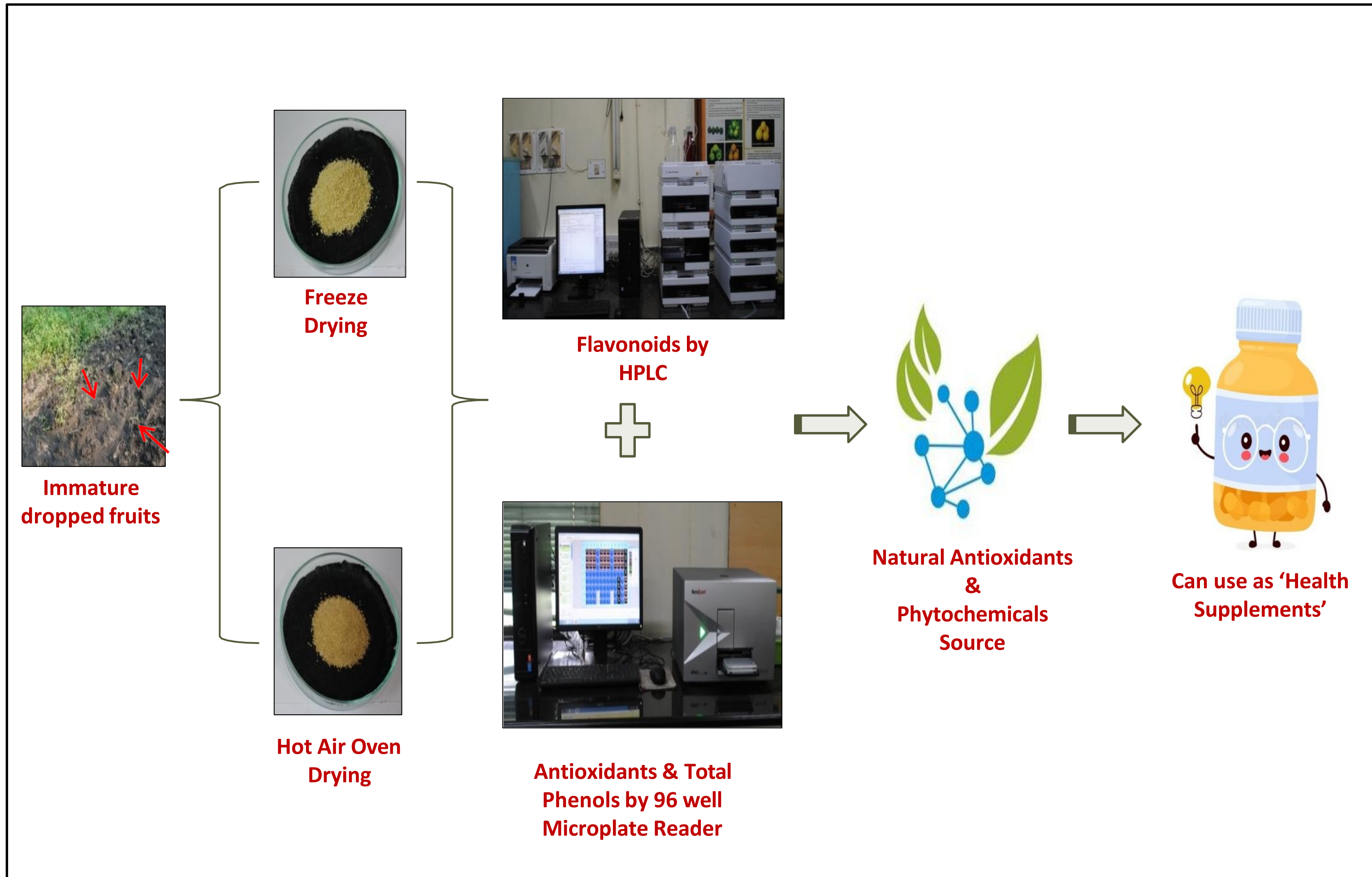


Physiologically Dropped Fruits
8 mm – 28 mm

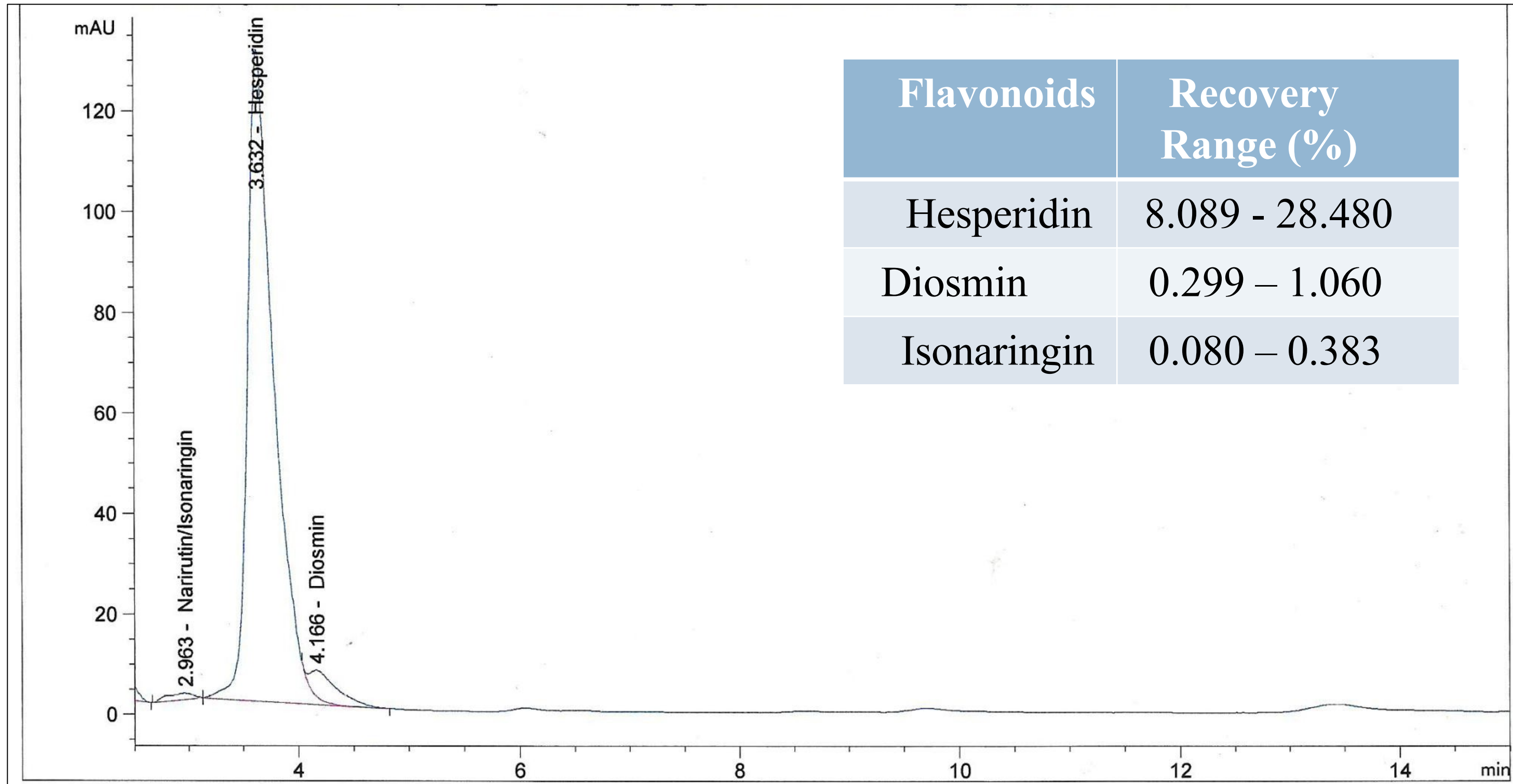


Future of Nutraceutical
Industry

Source of Natural Antioxidants and Phytochemicals



Chromatogram Of Hesperidin And Other Flavonoids In Dropped Fruits In High Performance Liquid Chromatography



Flavonoid Content In Dropped fruits

Sr. No.	Sample size (mm)	Hesperidin (%)	Narirutin/ Isonaringin (%)	Diosmin (%)	Didymin/ Neoponcirin (%)
1	8	24.30	0.143	0.28	0.281
2	10	26.63	0.118	0.17	0.331
3	12	28.74	0.134	0.18	0.384
4	14	27.67	0.147	0.13	0.354
5	16	21.03	0.212	0.14	0.459
6	18	15.49	0.098	0.07	0.369
7	20	11.47	0.191	0.07	0.685
8	22	8.095	0.26	0.0	0.417
9	24	7.777	0.325	0.0	0.342

Dropped Fruits and the Remuneration Paid to Farmers

Sanjiv Keshava <sanjiv@orementerprises.com>
To: Dinesh Kumar <dineshscn@gmail.com>

Dear Dinesh,
I've worked very hard in Maharashtra and have huge investments in the development of the infrastructure for the collection of immature citrus. You will understand that I have invested singularly without the help of any government / external agencies. I do not want to dilute my efforts by opening out the field to other entrepreneurs to take advantage of my efforts or to begin price wars in the field. Suffice it to say I have done well.
I will not venture to talk beyond.

Sanjiv Keshava.
[Quoted text hidden]

Dinesh Kumar <dineshscn@gmail.com>
To: Sanjiv Keshava <sanjiv@orementerprises.com>

Dear Sir,
No dilution to your effort. Kindly give a data how many tons procured and at what rate. We want to know the income to the farmers and whether extracted in India for employment or abroad.
Regards
[Quoted text hidden]

Sanjiv Keshava <sanjiv@orementerprises.com>
To: Dinesh Kumar <dineshscn@gmail.com>

Well I've collected to date some 800 tons since I started in 2016 which is about Rs 7 Cr in the hands of farmers/ labourers. While in 2019 itself was about 3.5 Cr in the hands of farmers /labourers. This is just in Maharashtra. This amount is likely to increase to 5 crores in 2020. Just in a period of 5 months from March to July. We are planning further collections of Mirik season which should add to the total. This is purely a conversion from total waste to revenue. An additional earning.

Sanjiv Keshava.
[Quoted text hidden]

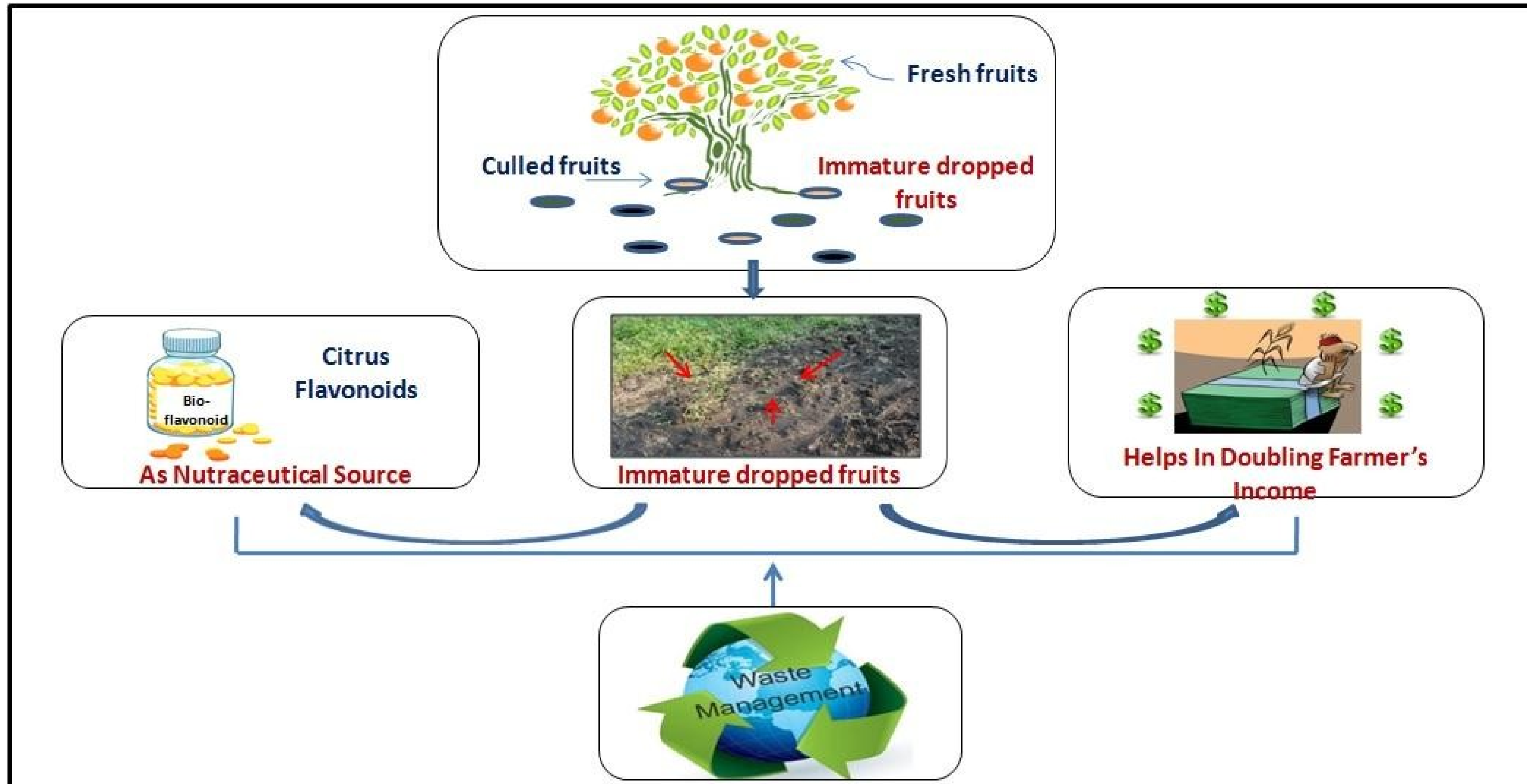
Sanjiv Keshava <sanjiv@orementerprises.com>
To: Dinesh Kumar <dineshscn@gmail.com>

Well the price varies as to what kind of material he brings in either wet or dry. If wet there is a processing cost for drying which is paid to an accumulator. On average the price paid varies between Rs 75/ per kg to Rs 85/- per kg.

The extraction takes place in india. For further details you will have to contact Servier.

[Quoted text hidden]

FUTURE OF INTELLIGENT FOOD FOR FARMERS PROSPERITY



Challenges to Overcome

Internal Challenges

These initiatives are not easy.

Common internal hurdles include:

- **Group Dynamics:** Ensuring fair profit sharing and avoiding capture by a few local elites.
- **Technical Skills:** A lack of skilled members to maintain and repair equipment (e.g., a solar panel, a freezer).
- **Business Acumen:** Shifting from a farmer's mindset to a business owner's mindset takes time and training.

External Challenges

The community cannot succeed alone.

They are often blocked by:

- **Lack of Capital:** High upfront cost for processing machinery is the single biggest barrier.
- **Infrastructure:** Poor roads, unreliable electricity (if not solar), and lack of clean water.
- **Policies:** Complex food safety laws (FSSAI in India) can be difficult for small groups to navigate.

FUTURE POTENTIAL

- ❖ Integration with smart agriculture for real-time waste management.
- ❖ Development of high-value products.
- ❖ Aligns with UN SDGs.
- ❖ Potential to reduce postharvest waste by 30-50% by 2035.
- ❖ Promote R&D for cost-effective valorisation technologies.
- ❖ Foster collaboration between farmers, industries, and policymakers.



*Thank
you*

