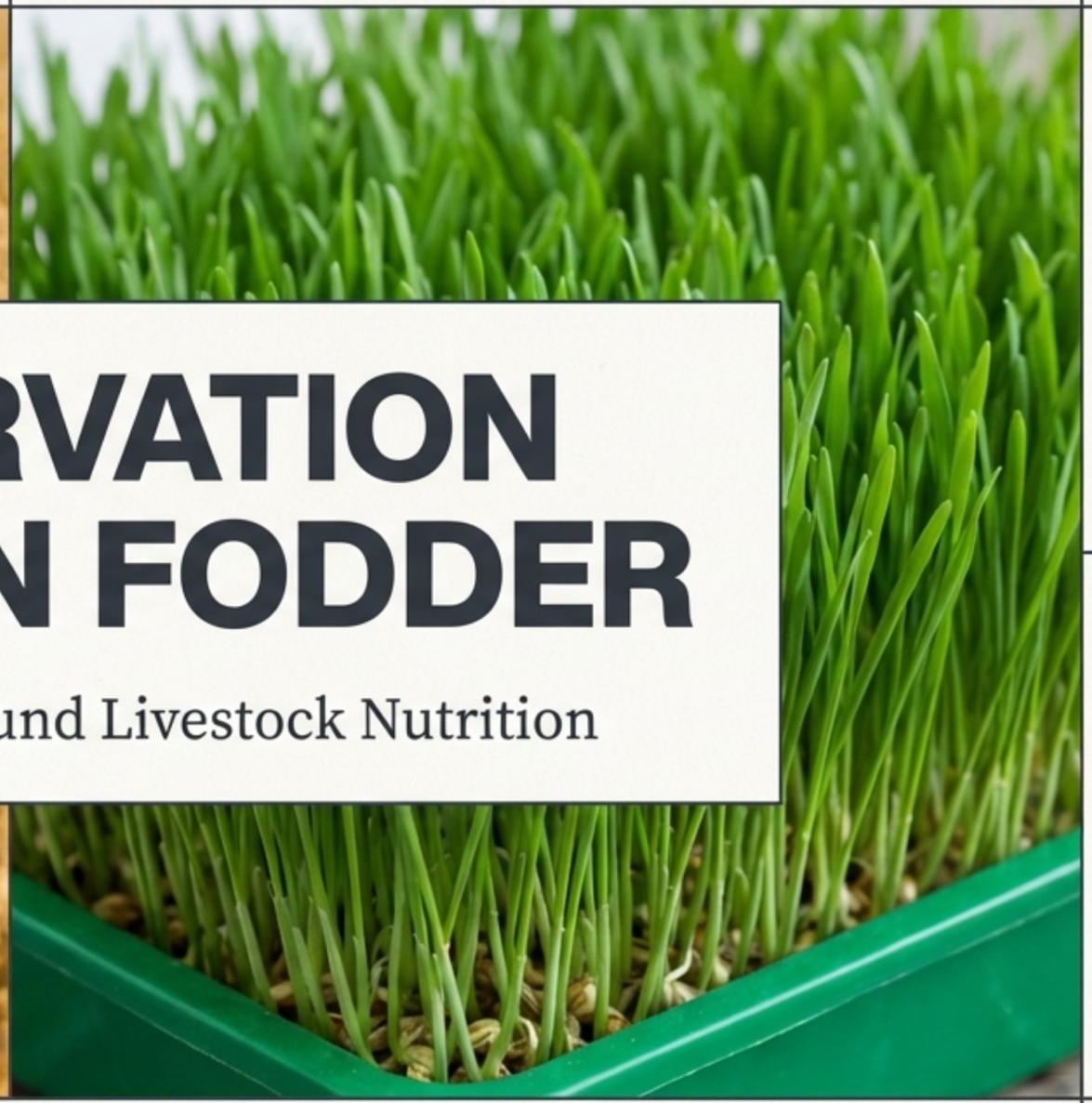
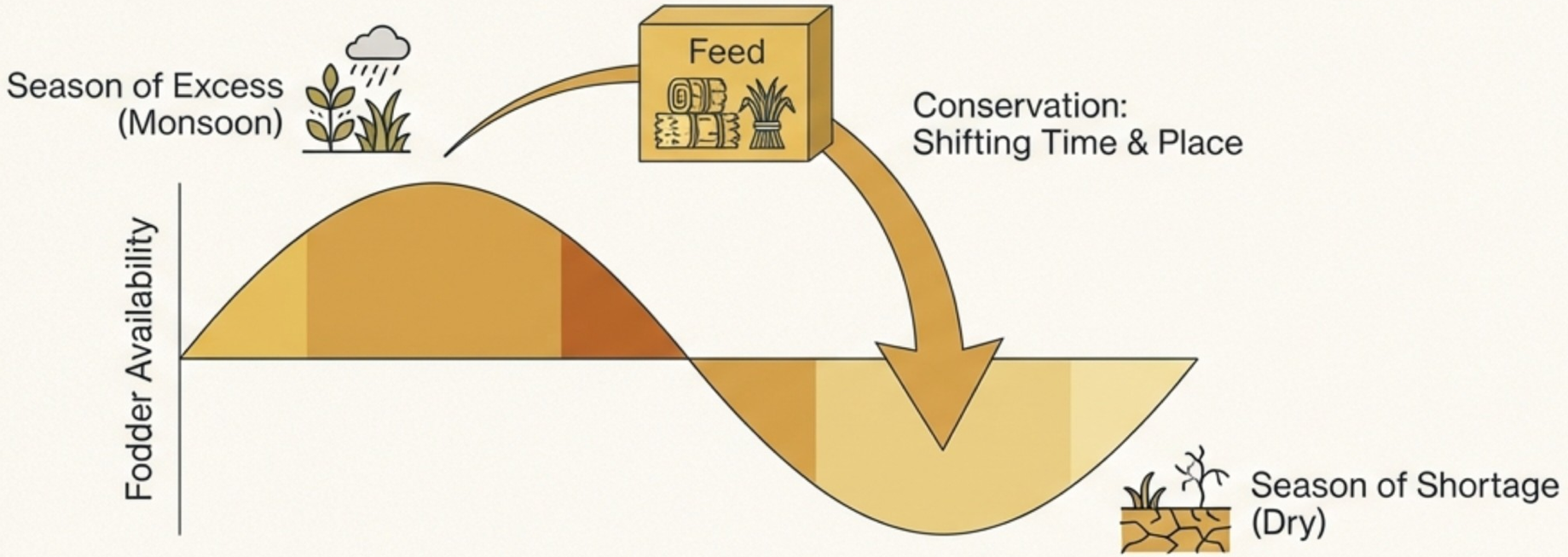


PRESERVATION OF GREEN FODDER

Strategies for Year-Round Livestock Nutrition

A Technical Guide to Hay and Silage Production

The Imperative: Why Conserve?



	•	Preserve feed when available in excess.	
	•	Maintain optimum nutritional value.	
	•	Shift available feed from the present to the future.	
	•	Assist in pasture management.	

Two Pathways to Preservation

HAY

Preserved by DRYING.

Target:
Moisture: 10-15%

Principle:
Inhibits enzyme action via dehydration.

SILAGE

Preserved by FERMENTATION.

Target:
Moisture: 60-65%

Principle:
Pickles forage via Lactic Acid production.

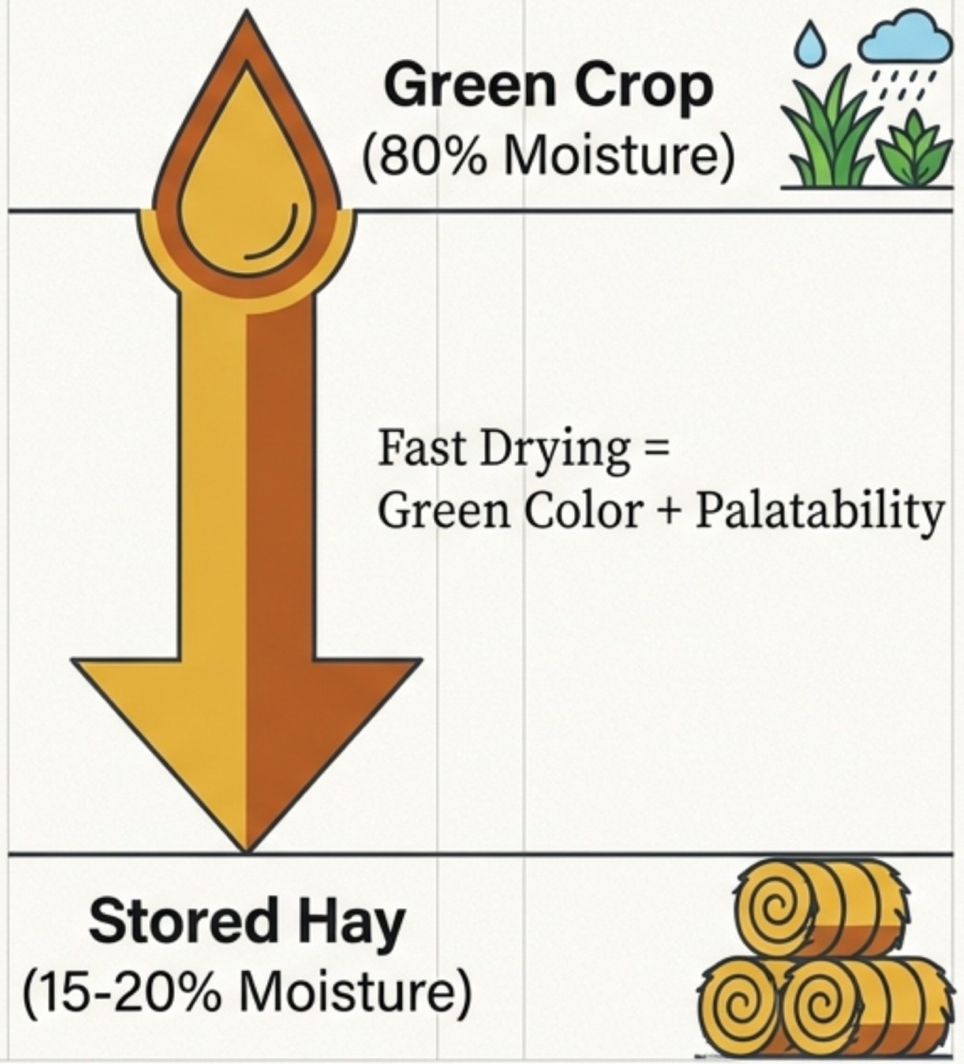
Hay: The Principle of Drying

Target Moisture:
10-15%

Target Dry Matter:
70-80%

Objective:
Minimize microbial growth.

The goal is to reduce moisture content to inhibit microbial enzyme action.



Hay Crop Classification

Legume Hay (Superior)

Higher digestible nutrients. Rich in protein, calcium, Carotene & Vitamin E.

Examples: Lucerne, Berseem, Cowpea, Soybean, Gwar

Non-Legume Hay

Rich in carbohydrates, but lower in protein and minerals. Less palatable.

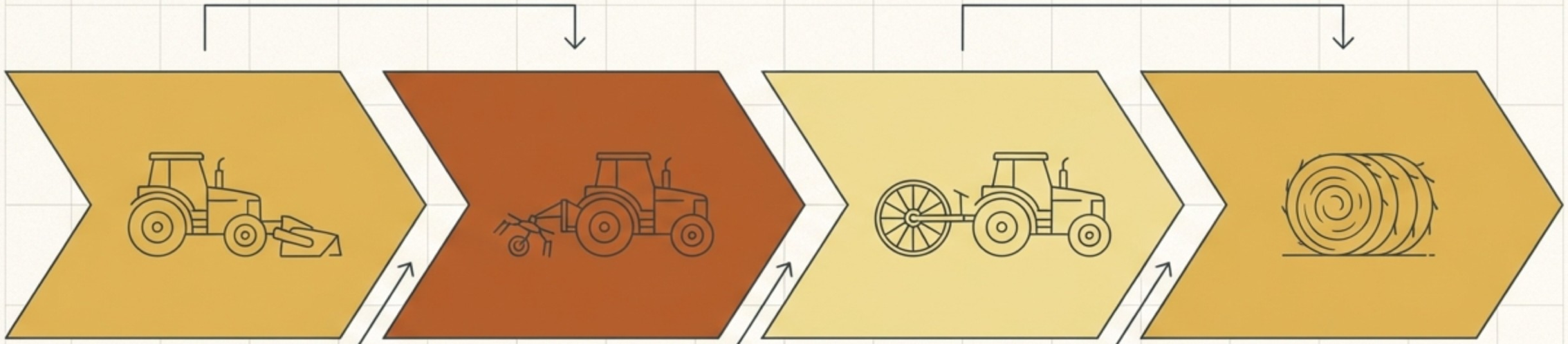
Examples: Maize, Oat, Sudan grass, Jwar, Bajara

Mixed Hay

A combination of legume and non-legume crops.

Examples: Oat + Legume

Production Workflow



Mowing
Cutting the standing crop.

Tedding
Spreading and aerating to speed drying.

Raking
Organizing dried hay into windrows.

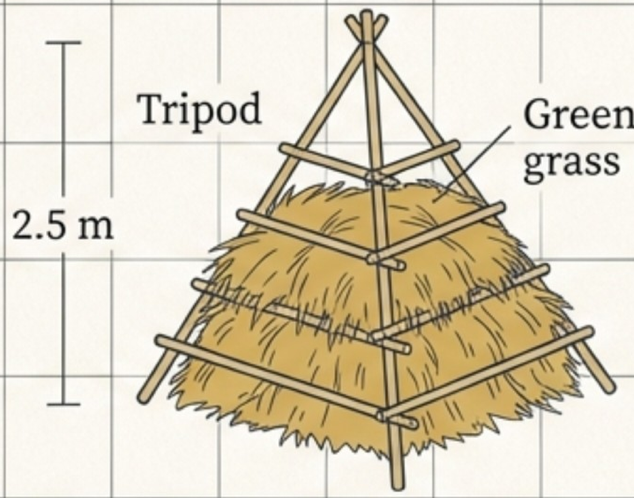
Baling
Compressing into bundles for storage.

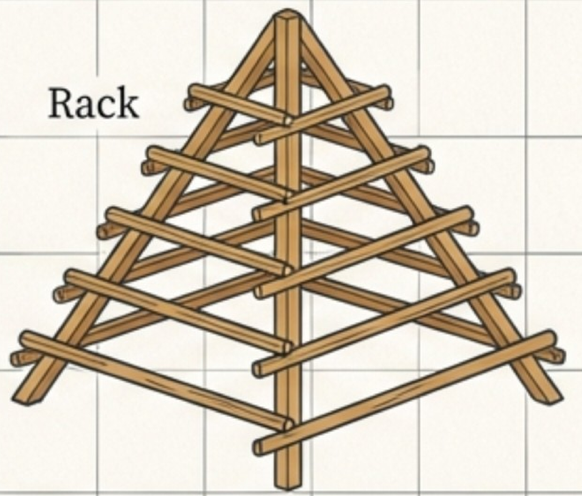
Curing & Drying Methods

Field Methods

Herbage wilts in the field.
Raked into windrows.
Risk of leaf shattering.

Structural Methods – Enhanced Airflow





Used to allow internal air circulation. Methods include Tripods, Tetrapods, and Farm Fences.

Modern Method: Electrical hot air chambers (200°C) for rapid dehydration.

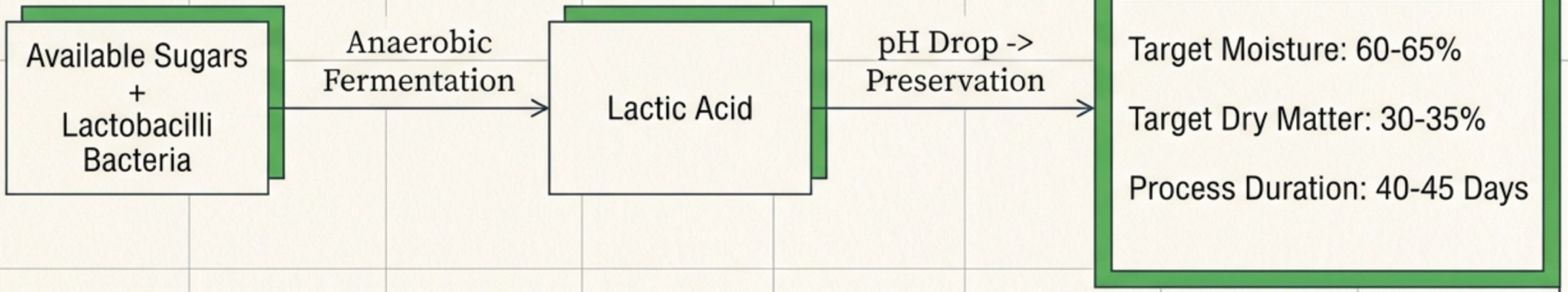
Hay Quality Assessment

Field Inspection Card

- Leafiness: Retains leaves (source of protein/vitamins).
- Color: Bright Green (indicates Vitamin A).
- Aroma: Characteristic sweet smell (no mold).
- Maturity: Cut at flowering stage.
- Purity: Free from weeds and dust.

Good quality hay Poor quality hay

Silage: The Principle of Fermentation



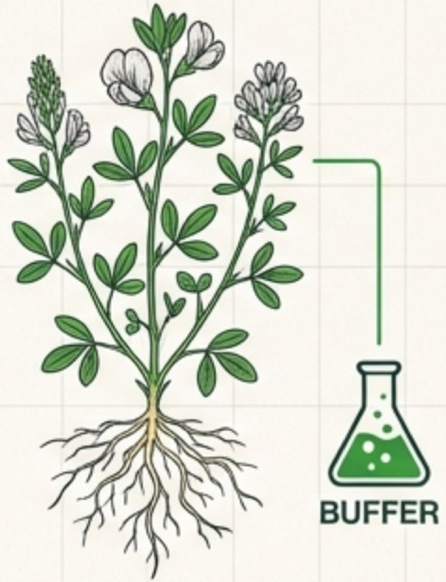
Silage Crop Suitability

The Ideal: Maize (Corn)

High sugar content ensures normal fermentation without additives.

High yield.

The Challenge: Legumes



High protein acts as a buffer, neutralizing acidity.

Low sugar content inhibits lactic acid production.

⚠ **Risk:** Slow pH drop allows *Clostridium* to produce butyric acid (spoilage).

The Chemistry of Quality

Risk: Slow pH drop allows *Clostridium* to produce butyric acid (spoilage).

Very Good Silage

→ pH 3.8 - 4.2

Lactic Acid: 8-12%
Butyric Acid: Nil
Smell: Sweet/Acidic

Fair Silage

→ pH 4.2 - 4.5

Ammonical nitrogen: 10-15%
Butyric acid: least amount
Smell: Satisfactory

Spoiled / Bad Silage

→ pH > 4.8

High Butyric Acid
Ammonical Nitrogen > 20%
Smell: Rotten/Foul

Presence of Clostridium

Silage: Advantages & Risks

Advantages over Hay

- **Space Efficient:** Less storage volume required.
- **Nutrient Retention:** No leaf shattering or bleaching.
- **Versatile:** Utilizing weedy or thick-stemmed crops.
- **Better** protein source.

Toxicity Risks

- **pH Failure (>5.0):** Allows Clostridium growth.
- **Toxic Formation:** Breakdown of amino acids into Tryptamine and Phenylethylamine.
- **Result:** Toxic to animals if absorbed in blood.

Unconventional Resources

Tree Leaves

Mulberry (*Morus indica*)

Tree Leaves

Peepal (*Ficus glomerata*)

Seesem (*Dalbergia sissoo*)

By-Products

Sugarcane By-products

By-Products

Mango Seed Kernel

Vegetable Processing Waste

Summary & Best Practices

Decision Matrix		
Method	**Ideal Crop**	**Success Metric**
HAY 	Legumes (Lucerne/Berseem) - if weather permits.	Moisture <15%, Green Color, Leaf Retention.
SILAGE 	Maize, Grasses, Thick-stemmed crops.	Moisture ~65%, pH 3.8-4.2, Lactic Acid Smell.

"Quality conservation shifts available feed from the present to the future, ensuring herd health regardless of the season."