MINI SILAGE BALING UNIT

Detailed Project Report

Cornext Fodder Entrepreneur Model

Pioneering a Fodder Revolution in India

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TABLE OF CONTENTS

COMPANY/INDIVIDUAL DETAILS

INDIVIDUAL NAME:	
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BALED SILAGE

Naturally Preserved, Highly Nutritious Fodder

Silage (or Ensilage) is a natural preservation and fortification of green forage such as Maize, Moringa, Bajra, Wheat, Jowar Berseem and Hybrid grass. These Forage plants are chopped and stored in an anaerobic condition in order to fortify through the fermentation process. This process is also called ensiling. A fully fermented silage is in Golden brown color with sweet smell and sufficient moisture.

Traditional silage making practices such as pits, bunkers and bags have inherent disadvantages, so the most advanced Baled Silage technology is more popular across the world. Silage Baling process uses advanced compaction technologies to create anaerobic conditions inside the bales and it also hastens the process of fermentation. The quality of baled silage is highly superior to any other traditionally made silage.

Features of Best quality Silage

1. The color is golden brown
2. Compaction or density must be at least 600 kg/m^3
3. Moisture while baling should be between 65% and 75%
4. Chopping length must be less than 2 cm.

Benefits of Baled Silage (ex: Maize Silage)

- High nutrition with high digestibility
- Increase in milk production
- Higher shelf-life
- Improved health in animals
- Higher profitability for dairy farmers
- Cheaper costs/kg of feed Dry matter

MACHINERY & EQUIPMENT

A. CORNEXT MINI SILAGE BALER - MSB500 AT Pro

Cornext *MSB500-AT-Pro* is India's first-ever indigenously developed MINI SILAGE BALER. The baler produces 60-80 kg bales with an output capacity of 40 bales per hour. Cornext MSB500 balers are producing silage bales in more than 20 states across India and in countries like Kenya, Kuwait, Nepal, Thailand, Sri Lanka, Bangladesh etc.

Features of MSB500 AT Pro

- MSB500 can bale any chopped forage, TMR or Hay
- The compaction rate of forage is between 600 and 700 kg/m^3
- The wrapping (UV stabilized film) ensures storing of bales in any climatic conditions
- High compaction rate ensures longer shelf life (up to 12 months)
- We can adjust number of wrapping layers in order to match required shelf life
- It is easy-to-operate hydraulic driven equipment
- The input power is 3-phase electricity

Highlights of Cornext MSB500 AT Pro

- Automatic Count of Wrapping Layers through Buzzer System
- Automatic Calculation of Bale Density
- Automatic Bale Weighment for Every Bale
- 3-Phase Power Input (or) Generator Power Input
- Hydraulic Lever Operated

MSB500 AT Pro MACHINE SPECIFICATIONS	
Machine Dimensions (W x L)	1200 x 3000 mm
Kerb Weight	1500 kg
Capacity of Hopper	200 kg
Operation System	Hydraulic
Power Source	3-Phase Electricity or Diesel Generator Set
Machine Output (bales/hr)	40 bales per hour
Machine Output (in MT) *	20-25 MT per day
Bale Dimensions	500 x 500 mm
Bale Weight **	60–80 kg

* - There are various factors which can impact the Machine Output per day
** - Bale weight depends on moisture content in chopped Material

B. CORNEXT SINGLE ROW HARVESTER

Cornext Single Row Harvester (Celikel) performs more harvesting with less fuel consumption. Single Row Harvester can harvest only one corn-row. It has a full hydraulic system so it presents high level performance. Harvesting height can be adjusted from tractor hydraulic arms. Safety has been kept forefront at the machine, safety pin practice has been integrated into the gear system to prevent possible damages.

Important Features of SRH

- Chopping length of 1-3 cm to ensure best quality baled silage
- It can harvest up to 4 acres in a day
- Low Maintenance Cost
- High Performance Chopping Technology
- Fragmentation And Grain Crushing
- Adjustable Cutting Size
- 180 Degree Chute System
- Hydraulic Controls
- User Friendly

CORNEXT SINGLE ROW HARVESTER SPECIFICATIONS	
Machine Dimensions (L x W x H)	2500 x 2350 x 3500 mm
Folded height	2180 mm
Weight	590 kg
Number of throwing pallette	6 Pcs
Number of Plywheel knives	12 Pcs
Working Position of Tractor	Side
PTO	540 RPM
Min. Required Power	40 HP Tractor
Working Capacity	40 Tons/Day
Working Width	700 mm

MANUFACTURING PROCESS & DELIVERY

The Silage Baling Operations are very meticulously scheduled and include following operations:

Crop Sourcing	• Identification of suitable source location • Testing of crop for moisture
Harvesting	• Harvesting the crop • Internal transportation to baling point
Inoculation	
Baling & Wrapping	• Loading the baler • Baling & Wrapping • Stocking in stacked manner
Transportation	• Loading onto the truck for transportation • Check Bales before loading
Delivery to Customer	• Delivery at the Farmer's doorstep.

A. CROP SOURCING

The following criteria has been set before identifying and finalizing crop for silage

1. Soils with good organic matter content having high water holding capacity with neutral pH are considered good for higher productivity. Fields having provision for proper drainage are preferred for cultivation of maize.
2. Rabi is the best season for silage. Machinery performs exceedingly well during dry seasons. The harvesting schedule starts in November and goes up till April. The choice of these months will also help in selling silage, as the major demand for the product will be towards Feb-ruary and continues to the beginning of monsoon season. Areas which can cultivate good crops during these seasons are chosen.

3. The minimum yield per crop has to be around 12 tons. Plant population, weight and girth of the individual plant will be an important factor in sourcing maize. Stunted growth means more effort, high cost, time consuming. The harvesting will be more expensive per acre in such scenarios.
4. Proximity to the baling point is also an important factor in picking a cluster.

B. HARVESTING THE CROP

1. The crop is harvested when it contains their highest nutrient levels, which is usually between 80th-90th day of the crop. A moisture level of 65-70% will allow for optimum fermentation.
2. If the grass is left out longer, it may get too dry, or it may get rained on - and both these will reduce proper fermentation.
3. We use the Cornext Single Row Harvester which is attached to the Tractor. A tractor trailer moves alongside the tractors and chopped material falls. The machine has a harvesting capacity of up to 4 acres per day under ideal conditions. However, in Indian conditions, we can go up to 2.5-3 acres
4. The machines chop the crop into even and small pieces about 0.5 in (1.3 cm) long which is an optimum length to achieve required compaction.
5. The chopped material is transported and dumped at the baling point.

C. INOCULATION

1. Before being compacted in a baler the chopped material is treated with an inoculant to ensure an efficient fermentation
2. Silage inoculants are additives containing anaerobic lactic acid bacteria (LAB) that are used to manipulate and enhance fermentation in corn silage.
3. To prepare silage we use ***Kem LAC HD Dry*** inoculant made by KEMIN, one of the best available brands in the market.
4. Around 1 gram is used per ton of chopped material.

D. BALING

1. The chopped material is then loaded into the hopper attachment of the baler.
2. A conveyor system transports the material from the hopper to the internal compression chamber where the compaction takes place.
3. The material is treated with the inoculant before being transported into the internal compression chamber.
4. The bale is given two layered wrapping (internal and external) using Polypropylene Film to ensure the compaction is intact until the bale is opened up for consumption.
5. Once the right amount of compaction is achieved the machine alarm indicates to begin the first level wrapping (internal wrapping)
6. The bale is then transported to the external baling unit for completion of the external wrapping of the bale. The baling completion is indicated by an alarm.

7. The final bale weight is noted down from the electronic weighment system and is ejected from the baler.
8. The bales are stocked in a stacked manner on a flat and dry area

Conveyor System

Internal Wrapping

Compacted Bale exiting Compression Chamber

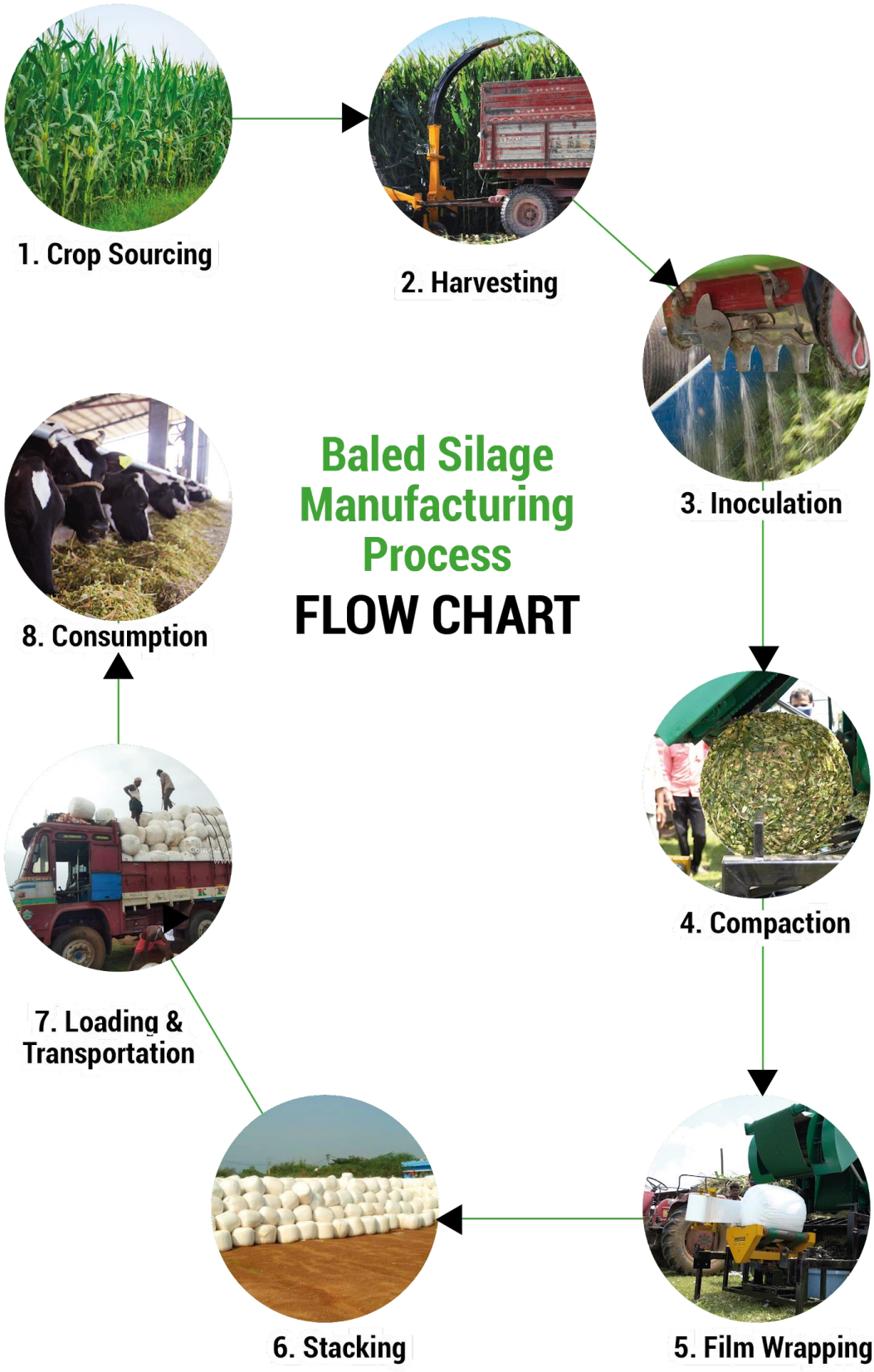
External Wrapping

Bale Ejection after Completion

Electronic Bale Weighment

E. LOADING & TRANSPORTATION

1. The bales are delivered directly at the customer's doorstep.
2. The bales are checked for any damages or punctures before being carefully loaded in the transport vehicles.
3. Based on the order quantity the vehicle with required capacity is hired.
4. Depending on volumes of the order quantity and availability of labours, auxiliary equipment like a JCB, Bull Tractors or Bale Handlers can be hired. This ensures an easy and efficient loading of bales into the transport vehicle.


1. Crop Sourcing
2. Harvesting
3. Inoculation
4. Compaction
5. Film Wrapping
6. Stacking
7. Loading & Transportation
8. Consumption
Baled Silage Manufacturing Process
FLOW CHART

5. F

SILAGE QUALITY PARAMETERS

Silage Quality

Physical Unit	Minimum	Maximum
I. Crop (Before Baling)		
Hybrid /variety	Manufacture should mention name of maize variety and hybrid used in production	
Stage of Crop to harvest	80 days	90 days
Place of Harvesting	Name of place from where crop has been taken to be mentioned	
Texture	Compact, uniform, moist & stuffy	
Chaff length - mm	5	25
Density - kg/m^3	600	850
Grain Visibility	Clear	Very frequent
Grain Presence % of Dry Matter	10*	15*
II. Sensory		
Flavor & Taste	Sweetened & Sour	
Odor	Off smell & pungent	
Color	Greenish brown / Greenish yellow	
III. Nutritional Values of Silage		
Moisture % on DM Basis	60	70
Dry Matter % Basis	40	30
Crude Protein % on DM Basis	7	9.5+
Crude Fat % on DM Basis	1.2	2.5+
Crude Fibre % on DM Basis	26	35
Acid Insoluble Ash % on DM Basis	2.5	4.5
Lactic acid % on as such Basis	3	14
ADF* % on DM Basis	18	33
NDF* % on DM Basis	35	45
Ash* % on DM Basis	2	8
pH % on as such Basis	3.6	4.2
TDN %	60	70
Aflatoxins B1 Ppb	-	20

Bale Quality

1. Acceptable Bale weight	50 to 80 kg
2. Acceptable Bale density	600 to 850 kg/m^3
3. Layer of Film Wrapping	6 to 8 layers
4. Bale should firm with the wrapping intact	

5. Bale shall have no punctures

SAFETY MEASURES

- Machine operators should have proper knowledge and training.
- Machine Operators should wear an apron, shoes and a helmet at all times while operating the machine.
- A minimum distance of 1 meter should be maintained while feeding the hopper.
- While inserting the stretch film don't keep the hands inside the belt or the rollers.
- No personnel should stand on hopper plates to unload the material from the tractor.
- No one under the age of 18 is allowed to operate the machine.

BALING EQUIPMENT SUPPLIER

Cornext is a National Award winning AgriTech company that can be credited for introducing a disruptive technology called **BALED SILAGE (natural preservation and fortification of green fodder)** in India. The company has won the National Startup Award 2020 and was recognised by Govt. of India (Dept. of Animal Husbandry) *"for using advanced technology to address fodder shortage in India, by introducing Baled Silage - a form of natural preservation of green fodder for crops like corn & jowar, that helps increase milk yield naturally."*

Cornext has pioneered Silage Baling Technology, having produced & distributed more than 1.2 Lakh MT of baled silage as high quality green fodder which is equivalent to 4 months of summer ration for at least 1 lakh animals. This effort has revolutionized the fodder space catering to a larger number of Indian dairy farmers which addresses the fodder shortage that is prevalent in many parts of the countries.

Cornext has introduced the MSB500 is India's first-ever indigenously developed MINI SILAGE BALER. The baler produces 60-80 kg silage bales with an output capacity of 40 bales per hour. Cornext MSB500 balers are producing silage bales in more than 20 states across India and in countries like Kenya, Kuwait, Nepal, Thailand, Sri Lanka, Bangladesh etc. It has recently launched the upgraded version MSB500 AT Pro with advanced Sensors and Alarm systems.

FINANCIAL & VIABILITY ANALYSIS

Financials

ASSUMPTIONS		
Sales price (Ex-Factory)	**₹5.50**	*per kg*
Repayment Schedule in years	**5**	*years*
Rate of Interest	**12%**	
Production per season	**1500**	*MT*
No. of Production days	**100**	*days*

WORKING CAPITAL		
Production in Metric Tonnes	300	*Metric Tonnes*
Total required Working Capital	**₹12,84,000**	*Half of production cost of one season*

FINANCIALS		
Total Capital Investment (A)	**₹48,95,000**	
NLM Subsidy (B)	₹24,47,500	
Net Capital Investment (A-B)	₹24,47,500	
Term loan on Cap.Inv.	₹24,47,500	
Annual Interest on term loan	₹2,93,700	*Assuming ROI 12% Per Annum*
Working Capital req.	₹12,84,000	
Interest on WC limits	**₹38,520**	*Assuming 3 months, and ROI 12% PA*
Total Investment	**₹37,31,500**	
Bank Finance Cap. Inv	₹24,47,500	
Bank Finance on Working Capital	₹12,84,000	
Gross Revenue	**₹82,50,000**	
Cost of Goods Sold	₹61,50,000	
Other Expenditure	₹5,00,000	
Gross Profit (EBIDTA)	**₹16,00,000**	
Depreciation	₹7,34,250	*@15%*
Finance Costs	₹3,32,220	
Profit Before Tax	**₹5,33,530**	
Net Profit	₹4,00,148	
Return on Investment	**32.7%**	
Return on Capital Employed	**25.9%**	

Capital Investment

	Capital Expenditure	Brand	Model & Specification	No. of Units	Unit Cost	Total Amount	NLM Subsidy	Net Capital Exp
1	**Mini Silage Baler**	*Cornext*	*MSB500 AT PRO*	1	**₹ 11,76,000**	₹ 11,76,000	**₹ 5,88,000**	**₹5,88,000**
2	**Cornext SRH**	*Cornext*	*Challenger II*	1	**₹ 13,44,000**	₹ 13,44,000	**₹ 6,72,000**	**₹6,72,000**
3	**Tractor 4WD**		*75-80 HP*	1	**₹ 15,00,000**	₹ 15,00,000	**₹ 7,50,000**	**₹7,50,000**
4	**Trolley**		*Single Axle (13.5*6.5)*	1	**₹ 2,75,000**	₹ 2,75,000	**₹ 1,37,500**	**₹1,37,500**
5	**Loader**		-	1	**₹ 1,00,000**	₹ 1,00,000	**₹ 50,000**	**₹50,000**
6	**Shed**		-	*20000 sqft.*	**₹ 5,00,000**	₹ 5,00,000	**₹ 2,50,000**	**₹2,50,000**
					GRAND TOTAL	**₹48,95,000**	**₹24,47,500**	**₹24,47,500**

Cost of Production

S. No	Operating Costs	Cost per MT
1	Purchase of Crop	₹2,100
2	Harvesting with Cornext SRH	₹300
3	Internal transportation (rented tractors)	₹200
4	Baling with Cornext Mini Silage Baler (using Electricity or Diesel Genset)	₹150
5	Inoculation	₹100
6	Wrapping Film (6 layered)	₹800
7	Labour Charges	₹250
8	Machinery Maintenance cost	₹30
9	Wastages & Moisture Loss	₹100
10	Diesel	₹250
	Total Cost of Production per MT	**₹4,280**

Note:

- Cost of transportation to Customer doorstep For any sale within a 100 km ₹500 - ₹600
- Financial Viability is calculated based on assumption that ex-works price is taken into consideration

Viability Analysis

	Unit	in Rs	2022-23	2023-24	2024-25	2025-26	2026-27
Sales Price of Silage per Ton(MT)			**₹5,500**	**₹5,750**	**₹6,000**	**₹6,250**	**₹6,500**
Production for 2 seasons	*MT*		**1,500**	**1,500**	**1,500**	**1,500**	**1,500**
Turnover			**₹82,50,000**	**₹86,25,000**	**₹90,00,000**	**₹93,75,000**	**₹97,50,000**
Direct Costs							
Crop cost per ton	*MT*	**₹2,100**	₹31,50,000	₹31,50,000	₹31,50,000	₹33,07,500	₹33,07,500
Harvesting and Chopping (using single row harvester)**	*MT*	**₹300**	₹4,50,000	₹4,50,000	₹4,72,500	₹4,95,000	₹4,95,000
Process Waste and Moisture Loss	*MT*	**₹100**	₹1,50,000	₹1,50,000	₹1,57,500	₹1,65,000	₹1,65,000
Inoculation	*MT*	**₹100**	₹1,50,000	₹1,50,000	₹1,57,500	₹1,65,000	₹1,65,000
Internal Transportation	*MT*	**₹200**	₹3,00,000	₹3,00,000	₹3,15,000	₹3,30,000	₹3,30,000
Wrapping film for baling	*MT*	**₹800**	₹12,00,000	₹12,00,000	₹12,60,000	₹13,20,000	₹13,20,000
Labour cost	*MT*	**₹250**	₹3,75,000	₹3,75,000	₹3,93,750	₹4,12,500	₹4,12,500
Diesel (tractors, DG-set, load-all)	*MT*	**₹250**	₹3,75,000	₹3,75,000	₹3,93,750	₹4,12,500	₹4,12,500
Total Direct Costs			**₹61,50,000**	**₹61,50,000**	**₹63,00,000**	**₹66,07,500**	**₹66,07,500**
Operational profit			**₹21,00,000**	**₹24,75,000**	**₹27,00,000**	**₹27,67,500**	**₹31,42,500**
Indirect Costs							
Operator salary	*6 months*	**₹1,50,000**	₹1,50,000	₹1,50,000	₹1,57,500	₹1,65,000	₹1,65,000
Spares and Maintenance	*Annual*	**₹50,000**	₹50,000	₹50,000	₹52,500	₹55,000	₹55,000
Marketing & Administrative Expenditure	*Annual*	**₹200**	₹3,00,000	₹3,00,000	₹3,00,000	₹3,00,000	₹3,00,000
Total Indirect Costs			**₹5,00,000**	**₹5,00,000**	**₹5,10,000**	**₹5,20,000**	**₹5,20,000**
Total Expenses			**₹66,50,000**	**₹66,50,000**	**₹68,10,000**	**₹71,27,500**	**₹71,27,500**
Gross Profit (PBDIT)			**₹16,00,000**	**₹19,75,000**	**₹21,90,000**	**₹22,47,500**	**₹26,22,500**
			19%	**23%**	**24%**	**24%**	**27%**
Interests	*Annum*		**₹3,32,220**	**₹3,32,220**	**₹3,32,220**	**₹3,32,220**	**₹3,32,220**
Depreciation	*Annum*		**₹7,34,250**	**₹7,34,250**	**₹7,34,250**	**₹7,34,250**	**₹7,34,250**
Profit Before Tax			**₹5,33,530**	**₹9,08,530**	**₹11,23,530**	**₹11,81,030**	**₹15,56,030**
PBT\Sales			**6.47%**	**10.53%**	**12.48%**	**12.60%**	**15.96%**

MARKETING OPPORTUNITIES

1. Existing order book of INR 30 lakh - Buyback Support from Cornext Agri Products
2. Cater to dairy farmers in the near vicinity; upto 100 kms.
3. One Silage Baling unit can support upto 2500 animals over a year.
4. Baling of other crops like wheat straw, paddy straw, jowar, moringa etc.

SWOT ANALYSIS

STRENGTHS	WEAKNESS
1. Developed with 100% Indigenous Technology 2. 95% spares available in the market 3. Mini Silage baler runs on electricity 4. Cheapest production cost	1. Semi Automatic Machine - requires one operator, one assistant 2. When no access to electricity, diesel generator set is required to operate 3. Chopped forage is perishable in nature; immediate baling of freshly chopped crop is required
OPPORTUNITY	**THREATS**
1. 30 crore bovine population in India 2. There is a 50% shortage of green fodder 3. Animal feed is a growing industry - 12 to 15% growth per annum	1. Composite feed industry may come up with hybrid models. 2. Composite feed industry has bigger market network 3. Weather dependent; difficult to continue operations during rainfall.