Title: Processing of Banana Pseudo-stem into Value Added Products: Attempt for waste to Wealth

Category- Agriculture, **Horticulture**

Challenges:

Maharashtra is the 2nd largest grower of banana in the country with 71072 hectors, out of this, Jalgaon district alone has 55000-60000 hectares of banana plantation each year having the highest banana average productivity of 55-60 MT/hectare. Nearly 300000-325000 people earn their living on banana cultivation, harvesting, handling and transportation of banana.

The banana pseudo-stem after harvesting of Banana bunch generating approximately 70-80 MT per hector is thrown on boundaries and burnt after drying wasted presently by the banana grower. The farmers are having disposal problems with the pseudo-stem and incurring heavy expenditure on the disposal without getting any income. Jalgaon district alone generates about 38,50,000 MT of biomass from banana pseudo-stem every year.

- The biggest challenge is convert this huge Biomass of Banana Pseudo-stem into value added products
- Second challenge was to convince the farmers for extraction of their biomass into Fibre, Sap, and scutcher i.e. basic products from Banana Pseudo-stem.
- Third challenge was to convince the farmers for utilization of Sap as plant growth promoter and conversion of scutcher into Compost
- It is very difficult to change the mind set of farmer in context to:
  - Banana pseudo stem is a gold mine
  - Compost made out of scuture is very good compost for soil.
  - Banana sap has high valuable nutrients for crop growth.
- Transportation of banana stem is a laborious as well as expensive

After seeing the results of the project farmers are becoming partners of this project.

Initiative:

- Formations of Clusters in Banana growing area for Banana Extraction.
- Utilization of huge **waste** Biomass of Banana Pseudo-stem into **best** value added products
- Additional income from waste to the Banana Growers
- Saving of the expenditure incurring on disposal of banana Pseudo-stem
- Minimizing the cost incurring on Chemical fertilizer by using the Organic Liquid Fertilizer and Vermi-compost/Compost from banana Pseudo-stem
- Increasing fertility of the soil by using the Organic Liquid Fertilizer and Vermi-compost/Compost from banana Pseudo-stem
- Employment generation at village level through cottage industry

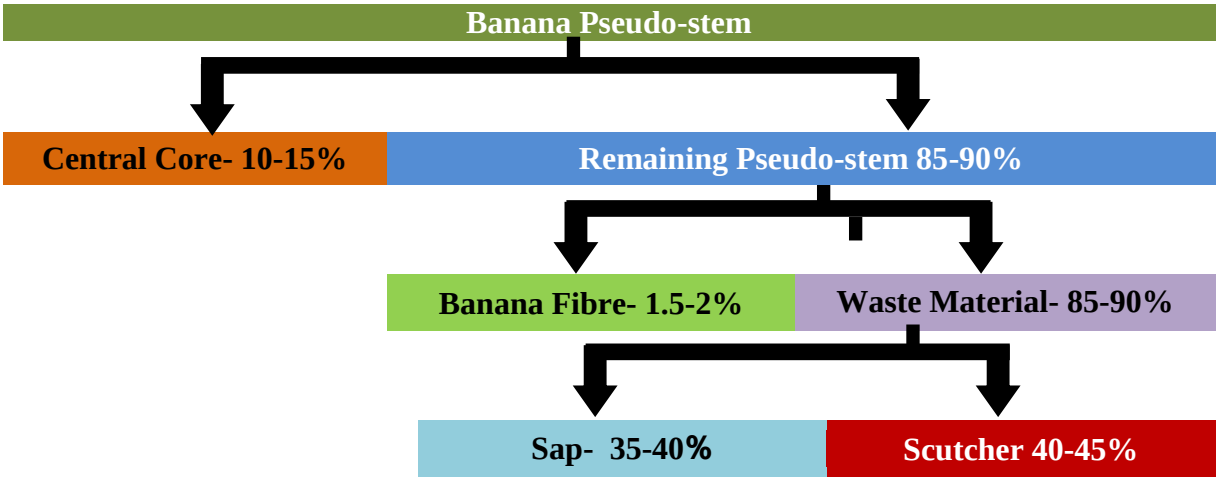
Key results/interesting facts:

Jalgaon district is banana producing district in Maharashtra State. There is Banana Plantation on 55000 to 60000 hectors in Jalgaon District, with an average productivity of 55-60 MT/hectare.

Availability of Banana pseudo stem is 70-80 MT/ha. It means in all 38,50,000 MT of pseudo stem of banana are available for further process. Earlier, farmers use to burn the pseudo-stem after drying on boundry of the farm.

Long distance transportation of pseudo-stem is not economically viable as these are bulky; also the labour handling cost is prohibitive. But it is possible to economically process banana pseudo-stem and extract fibre at local village levels only.

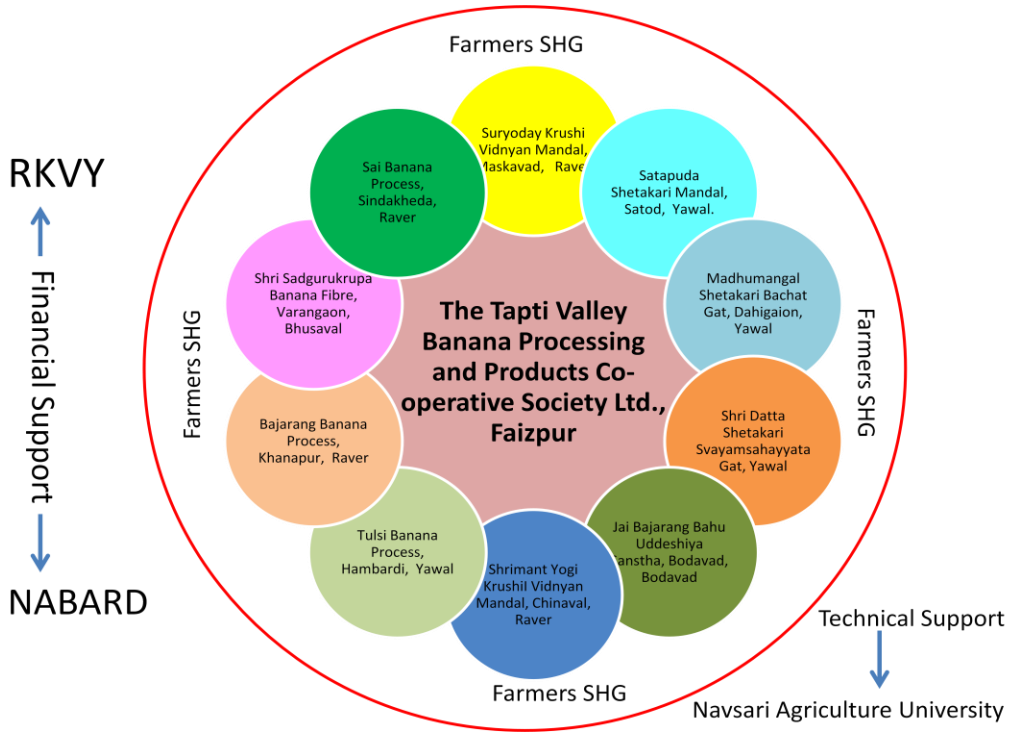
a) Components of the Banana Pseudo-stem



b) Cottage Industrial Unit-

Since the Banana Pseudo-stems are bulky, heavy transportation cost incurs on transportation. In order to avoid the transportation cost the project consists 20 Cottage Industrial Units. Out of 20 Units the Society has established 10 Cottage Industrial Units and these Units are in functional state.

The Society has established 10 Clusters in the banana growing areas Each cluster is provided with 2000 Sq. Ft. Shed, 10 Fibre Extraction Machine, 2 Pseudo-stem splitting machines, 1 Press Machine for separation of Sap, 3 Compost pits, Electrical fitting and connection, 5 storage Tanks, 75 Crets and treys. 10 more clusters will come up in 2017-18 under the project.



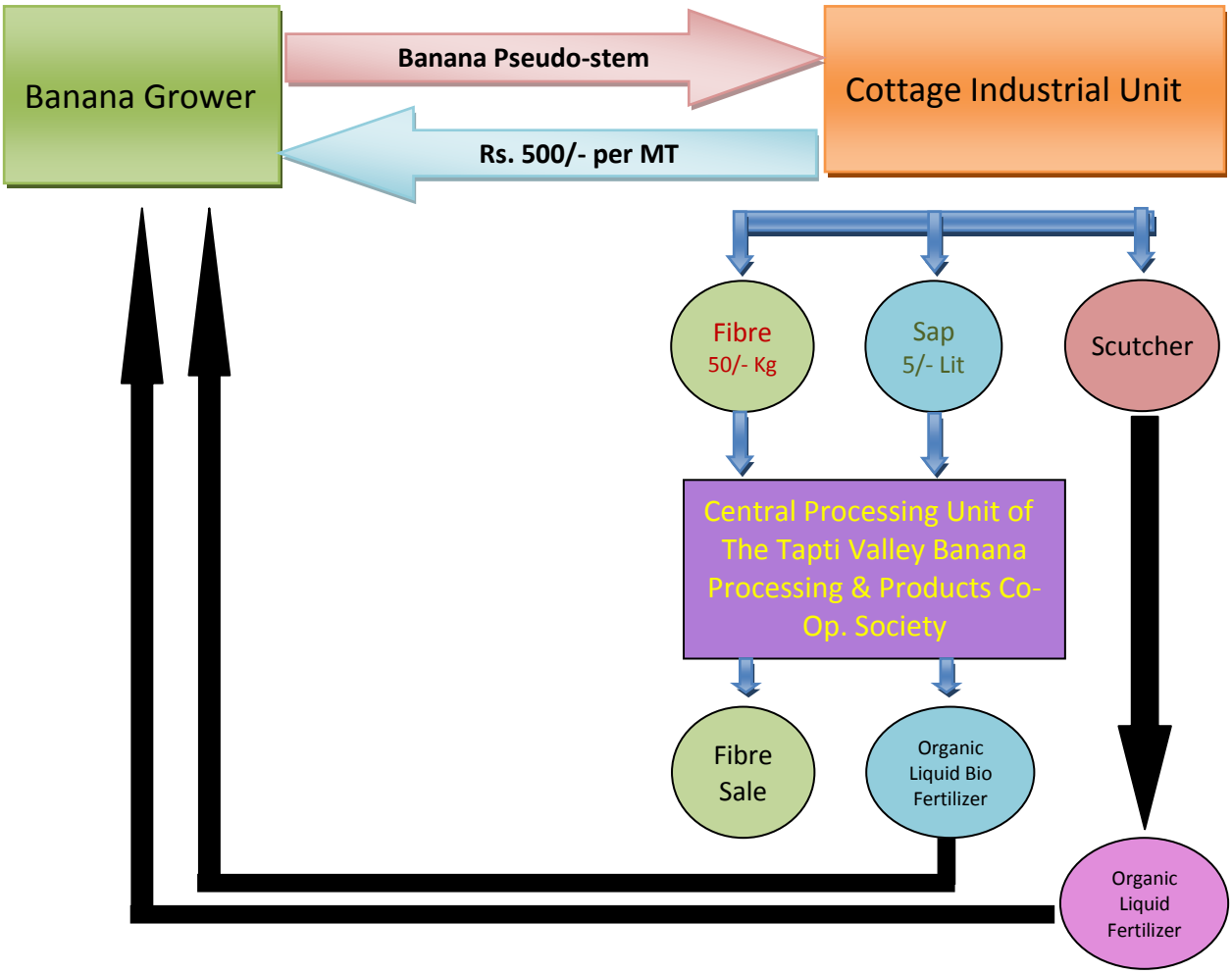
The Banana Growers bring their Banana Pseudo-stems after cutting bunch of Banana to nearest Cottage Industrial Units and gets Rs. 500/- per MT. These Units are operated by the local farmers SHG. The Unit extracts Banana Fibre from Banana Pseudo-stems. The Banana Fibre and Sap is carried to Central Processing Unit established by Tapti Valley Banana Processing & Products Co-Op Society at Gat No- 311, Pimprud, Taluka- Yawal for value addition.

The Cottage Industrial Units makes compost at Unit from the Scutcher waste and sell to local farmers.

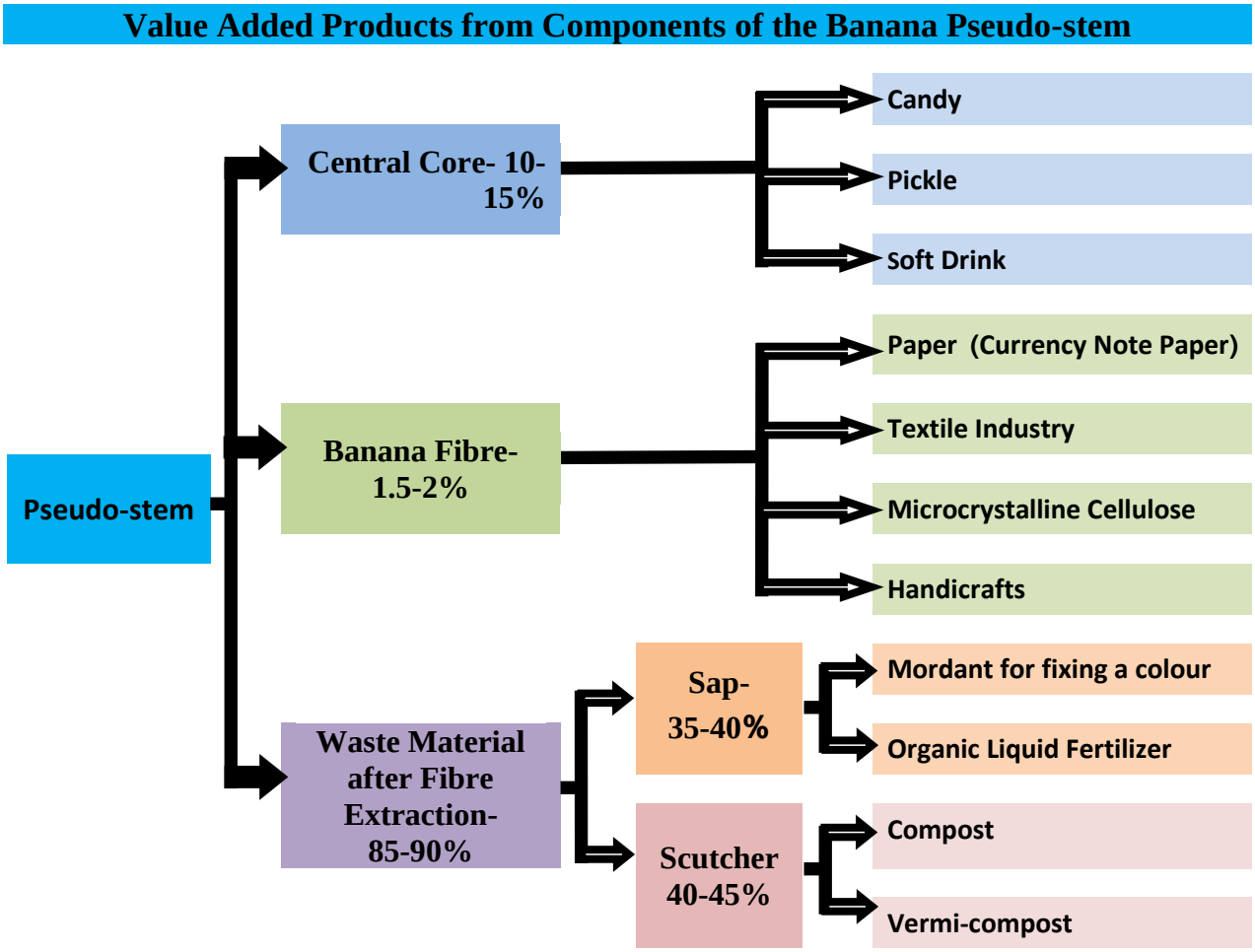
c) **Process of Banana Fibre Extraction at Cottage Industrial Unit -**

Single Fibre Extraction Machine can extract around 15-20 Kg. of banana fibers per day from 1 MT of pseudo-stem (approximately 50 to 60 nos. of pseudo-stem), to achieve maximum utilization of available pseudo-stems large number of units need to be established across the banana cultivation area.

d) Flow Diagram of the Project-



e) **Value Added Products from Components of the Banana Pseudo-stem-**



f) **Central Processing Unit-**

The Society has established Central Processing Unit at Gat No- 311, Pimprud, Taluka-Yawal, where value added products from Banana Fibre, Sap and Scutcher is manufactured.

A. **Products from Sap-** The Liquid portion Sap obtained along with scutcher during Fibre extraction from Banana Pseudo-stem is good source of plant nutrients such as N, P, K, Micronutrients along with growth promoting harmons like Cytokinin & Gibberellic Acid GA3 etc. If used as liquid fertilizer either through drip system or drenching to crops, it can save 20-40% dose of chemical fertilizer with yield advantage of 10-15%.

i. **Organic Liquid Fertilizer from Sap**- The Organic Liquid Fertilizer, is a research of Navasari Agricultural University and Patented the Product. We are manufacturing this product under license from Navasari Agricultural University.
The Organic Liquid Fertilizer has been prepared using only organic inputs and hence suitable for use in organic farming systems as liquid formulation. The composition is as below-

Chemical			**Bio-Chemical**		
Ingredients	**Unit**	**Mean**	**Ingredients**	**Unit**	**Mean**
N	%	0.062	Total Phenol	Mg/100 ml	48.0-49.1
P		0.018	Urase Activity	U/ml/min	63-81
K		0.180	Gibberellic Acid	Mg/L	110.2-205.0
Ca		0.031	Cytokinin	Mg/L	137.8-244.3
Mg		0.092	**Microbe**		
S		0.010	Total Viable Count	CFU/ml	1065 X 10^3
Mn	PPM	5.73	PSB		1025 x 10^2
Cu		0.40	Rhizobium		285 x 10^2
Zn		2.92	Azotobactor		460 x 10^2
Fe		109.3	Fungal Count		1200

The Society has established Organic Liquid Fertilizer Plant at Central Processing Unit. Under the license from Navasari Agricultural University, the society is manufacturing Organic Liquid Fertilizer from Sap and marketing to farmers by the name "Tapti Energy"

ii. **Tapti Amrut-** Society is manufacturing low cost liquid fertilizer from Sap i.e. JIVAMRUT from Sap.

iii. **Organic Pesticide-** The Society is manufacturing organic pesticide from Sap. This product acts as pesticide as well as provides nutrients to crop.

B. **Products from Scutcher-** The scutcher is very good biomass for manufacturing Compost and Vermi-Compost

i. Compost- Under the project the good quality Compost is manufactured from Scutcher at Central Processing Unit and Cottage Industrial Unit and supplied to Farmers.

ii. Vermi-Compost- Under the project the good quality Vermi-Compost is manufactured from Scutcher at Central Processing Unit. The Society gets good quality of Vermi-Compost and Vermi-Wash and the same is supplied to farmers.

C. Products from Banana Fibre-

i. Paper- The society proposes to establish paper plant from Banana Fibre. This Plant will come up in 2018-19.

ii. Handicrafts- The society proposes train 10 women from each Cottage Industrial Unit for making Handicrafts from Banana Fibre. The Handicrafts prepared by the SHG will be marketed by the Society. This will incur income to the women.

iii. Textile- The society proposes to establish Yarn Unit from Banana Fibre. This Plant will come up in 2018-19.

iv. Microcrystalline Cellulose- It is not proposed in the project

D. Products from Central Core-

i. Candy/Soft drink & Pickle- These edible products from Ventral Core will be made by the Women SHG. The society proposes train 10 women from each Cottage Industrial Unit for making edible products from Central Core. The edible products prepared by the SHG will be marketed by the Society. This will incur income to the women.

Impact-

Sr. No	Product Name	Unit	Production			Sale		
			2016-17	2017-18	Total	2016-17	2017-18	Total
1.	Banana Fibre	Kgs	2380	1868	4248	1447	2587	4034
2.	Pseudo-stem Water (Sap)	Ltrs	61483	32350	93833	43139	46271	89410
3.	**Products from Sap**							
	a. Tapti Amrut	lLtrs	14310	7000	21310	14310	7000	21310
	b. Tapti Energy 1 Lit	No	6912	0	6912	2612	3079	5691
	c. Tapti Energy 5 Lit	Nos	891	205	1096	686	568	1254
	d. Tapti Energy 50 Lit	Nos	6	0	6	6	0	6
	e. Tapti Energy Loose	Ltrs	9518	17200	26718	4618	11627	16245
	f. Organic Pesticide	Ltrs	200	0	200	105	50	200
	g. Tapti Energy Rich	Ltrs	0	1500	1500	0	280	280
4.	**Products from Scutcher**							
	a. Organic Compost	Kgs	44000	0	44000	0	44000	44000
	b. Vermicompost	Kgs	5045	3270	8315	5045	3830	8875
	c. Tapti Vermiwash	Ltrs	1945	1660	3605	1815	1138	2953

Lesson learned:

- Transportation of bulky banana stem to the production unit is very laborious as well as expensive.
  To solve this problem, small Cottage Units were established to reduce the distance between farm and production unit.
- The farmers received outstanding results of Organic Liquid Fertilizer on Banana, Grapes, Pomegranate, Cotton, Onion, Orange and Strawberry.
- Many farmers from banana growing area of the Maharashtra State visited the project and propose to start such project in their areas.

Supporting quotes and images

Photos-

Cottage Industrial Unit

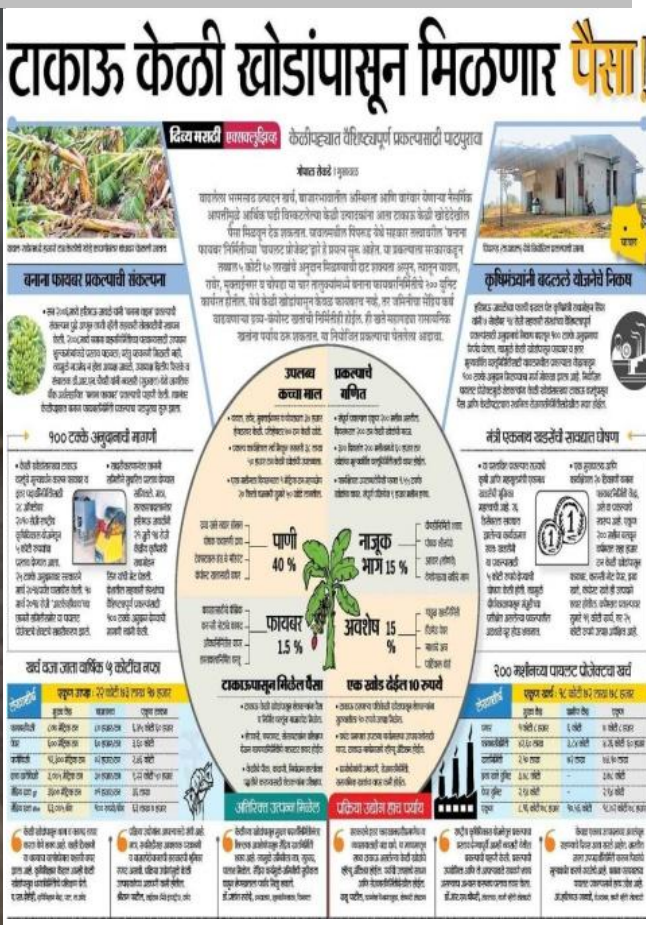
Working at Cottage Industrial Unit

Signing MOU with Navsari Agricultural University

Organic Liquid Fertilizer Plant

Dr. Winfred Suiss, KFW Germany Consultant Visit to Project

Banana Fibre

Vermi Composting	Composting the Scutcher
	
Organic Liquid Fertilizer	**Publicity in News Paper**
	

Additional information:

- **List of all project partners**
  Funder: The Tapti Valley Banana Processing and Products Co-Op. Society Ltd. Faizpur
  Partner: Banana Research Centre, Jalgaon (A unit of Mahatma Phule Krushi Vidyapith Rahuri)
  Project Sanctioned by- Government of Maharashtra
  Project sanctioned under- Rashtriya Krishi Vikas Yojana , Government of India, New Delhi
  Project Financed by- National Bank for Agriculture and Rural Development (NABARD)
- **Knowledge partner**
  - Navsari Agricultural University, Navsari, Gujarat

- **Implementer**
  - The Tapti Valley Banana Processing & Products Co-operative Society ltd. Faizpur District- Jalgaon, (Maharashtra State)
  - Field Partners of implementers for Cottage Industry Units :
    - Suryoday Krushi Vidnyan Mandal, Maskavad, Taluka- Raver
    - Satapuda Shetakari Mandal, Satod, Taluka- Yawal.
    - Madhumangal Shetakari Bachat Gat, Dahigaion, Taluka- Yawal
    - Shri Datta Shetakari Svayamsahayyata Gat, Yawal
    - Jai Bajarang Bahu Uddeshiya Sanstha, Bodavad, Taluka- Bodavad
    - Shrimant Yogi KrushiI Vidnyan Mandal, Chinaval, Taluka- Raver
    - Tulsi Banana Process, Hambardi, Taluka- Yawal
    - Bajarang Banana Process, Khanapur, Taluka- Raver
    - Shri Sadgurukrupa Banana Fibre, Varangaon, Taluka- Bhusaval
    - Sai Banana Process, Sindakheda, Taluka- Raver
  - Farmers

Link to supporting material:

- http://nhm.nic.in/Archive/bananafibre.pdf
- http://agropedialabs.iitk.ac.in/.../7.BY-PRODUCTS%20UTILIZATION%20FROM%20BAN
- http://ojs.cnr.ncsu.edu/index.php/JTATM/article/download/6825/3586
- www.researchgate.net/publication/282284953_Banana_Fiber_Scope_and_value_added_product_development
- http://circot.res.in/circot/images/projects/Value-Chain-on-Utilization-of-Banana-Psuedostem.pdf
- http://nrcb.res.in/pdf/Ex%20Folder%201%20-%20Value%20Added%20products%20from%20Banana.pdf
- www.scribd.com/document/93472423/English-Booklet-Banana-Pseudo-Stem-Final-27-04-2011
- http://www.agritech.tnau.ac.in/success_stories/success_story_kvk_kanyakumari3.html

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