

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Boosting Sugarcane Productivity by Recycling Crop and Industry Residues

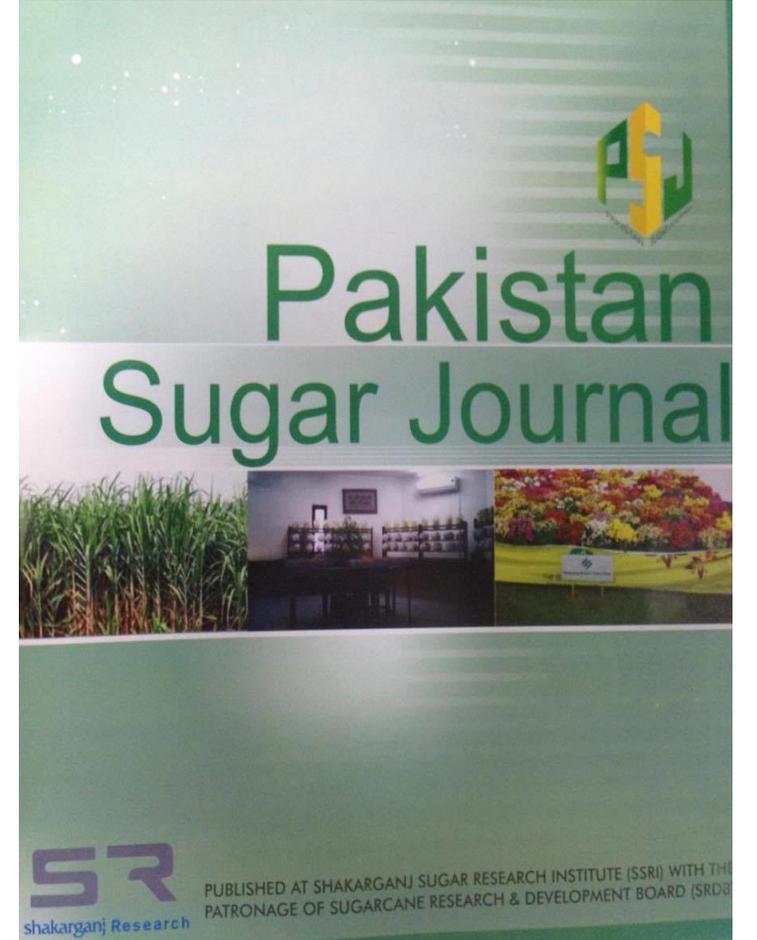
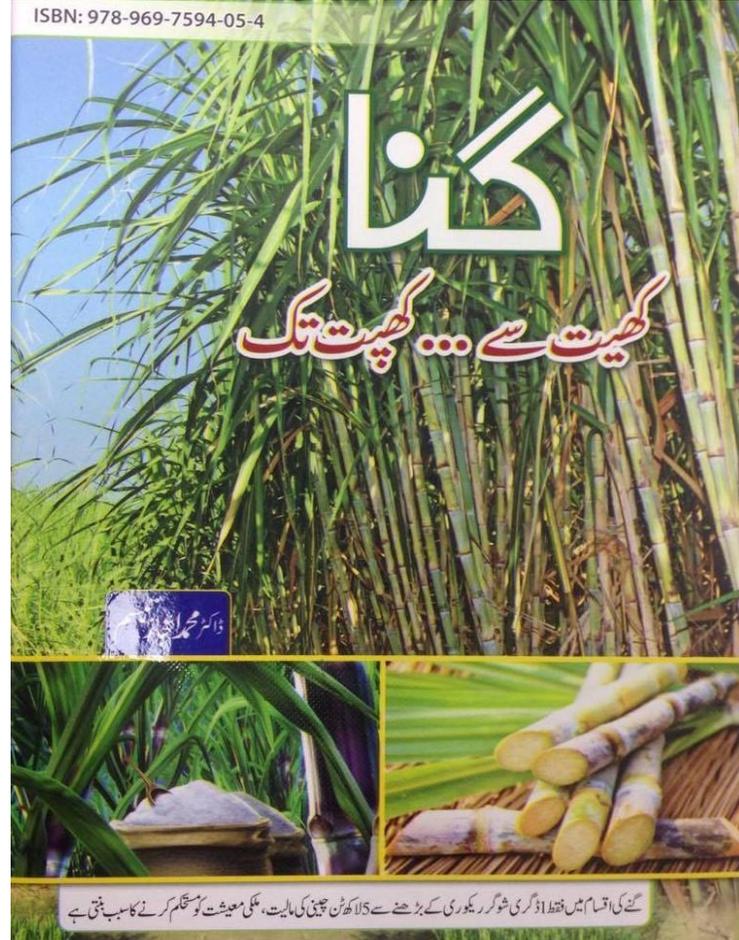
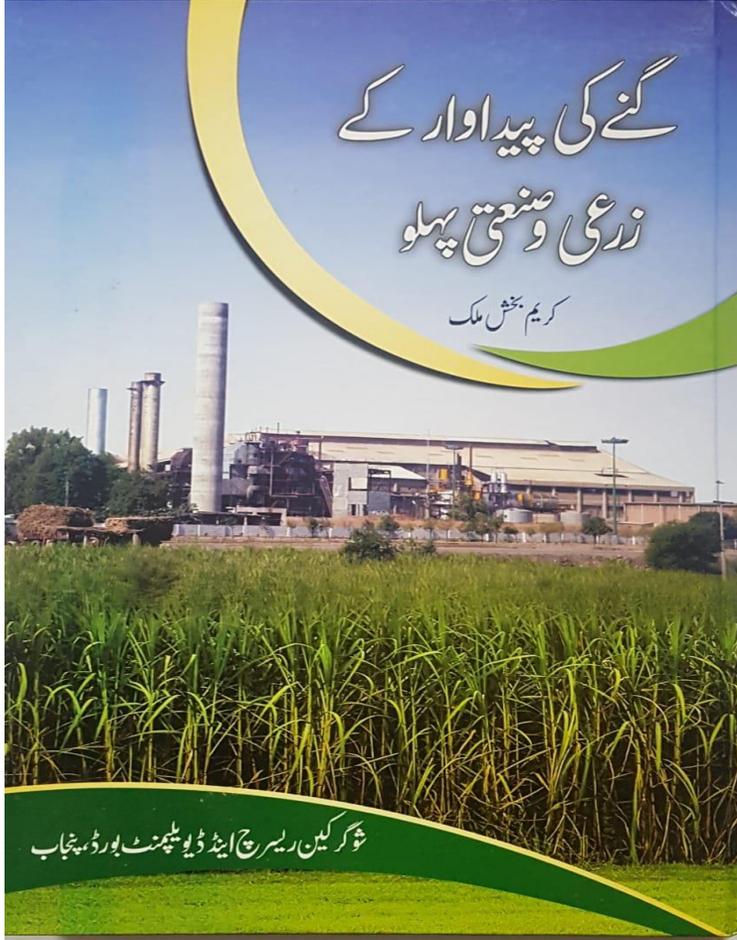
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SRDB Support/Facilitation for Sugar Industry

- ❖ *5 Year Agreement (500,000 USD) for Import of 10 Varieties & 100 Bi-parental Crosses/Year from Brazil*
- ❖ National/International Trainings of Technical Staff
- ❖ Cane Varietal Development Plans/Projects/Feasibilities
- ❖ Import of Innovative Technologies (Bios - Sustainability)
- ❖ Establishment of Accredited Labs
- ❖ Membership/Certification - BONSUCRO (BSI)
- ❖ Production of Organic Products (Certificated by CUI Netherlands)
- ❖ Biopolymers/Livestock Feed from Molasses
- ❖ Publication of PSJ/Books

Publications

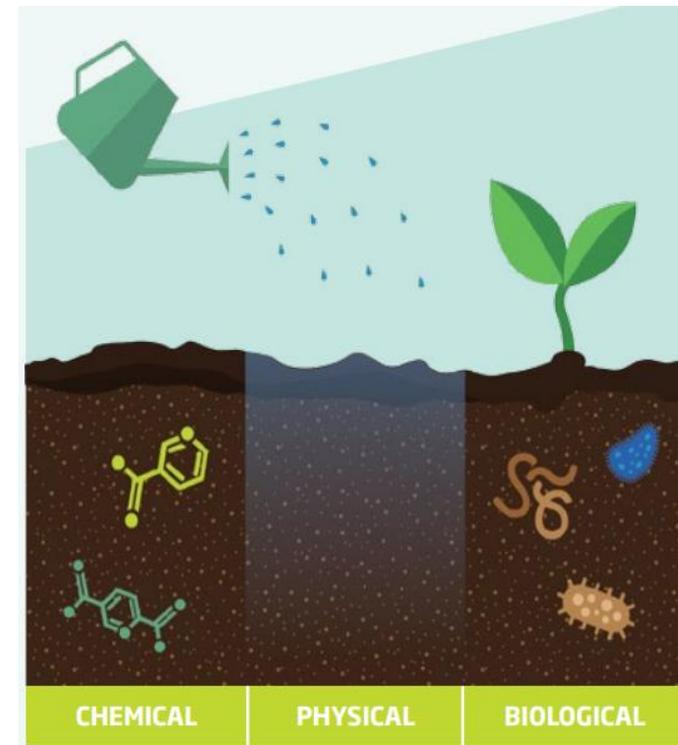


R and D at Industry Level

- Pakistan Sugar Industry - Luxury of litter R & D
- The benefits - with well funded R&D - 6-Bees:
 - ✓ Better Sugarcane Varieties
 - ✓ Better Agronomic Practices
 - ✓ Better Fertigation and Pest Management
 - ✓ Better Cane and Sugar Yields
 - ✓ Better Informed Cane Growers
 - ✓ Better Sugar Manufacturing Technologies

Why Organic Matter (OM)?

- **Organic Material-**
 - LEAVES, TRASH, MANURE >1 % - Unstable
- **Organic Matter:**
 - Decomposed into Humus < 0.6% Stable
- **BIOLOGICAL & ENVIRONMENT FRIENDLY:**
 - Soil Health
 - C-Source - Soil organisms - Soil biodiversity.
 - Mitigates climate change - Lowers emissions of CO₂



Sugarcane Fertilization

- **60% Farmers use less than 3 bags of Urea/acre**
- **70% Farmers less than 2 bags of DAP/acre**
- **90% Farmers do not use Potash**
- **05% Farmers use FYM, PM, FC, GM, CR etc.**

Source: Annual Report 2004-05 NIINMS, Sugar Crops, NARC)

Sugarcane Trash Management

Burning the trash



Most deleterious method: Pollution



Easy in field operations



Sources of GHG (N_2O , CO, CO_2)

Sugarcane Trash Management

- Use as mulch for moisture conservation.
- Incorporating trash in soil for moisture and nutrients



Trash Blanket: **moisture conservation**



K requirements reduced by 25-30 Kg/ha
N requirement reduced by 50-60 Kg/ha

Trash - Adds to the Soil

- ✓ **5.3 kg N per ton of trash**
 - ✓ **1.1 kg P per ton of trash**
 - ✓ **5.8 kg K per ton of trash**
-
- **Incorporating 5 tones trash with 75 kg N fertilizer increased cane yield by 37.5 %**
 - **Fertilizer dose reduced by 50 %**

Source : Verma, 2002

Trash Management – Power/Paper



Trash Harvesting: 4th Cycle Ratoon Crop, Argentina

Trash Management



Sugarcane Trash Mulcher



Trash Blanket Weed Control in Ratoon, Brazil



RM - EM/Trash Level



Stubble Incorporation

Left over stubbles : 5-10 ton/ha

Roots : 3-6 ton/ha

Nutrients ha:

N	50-100 kg	Burning /Removal - ✓ Organic Matter ✓ Nutrients ✓ Microbiota
P	5-10 kg	
K	30-90 kg	
Ca	30-50 kg	
Mg	15-25 kg	
S	8-18 kg	

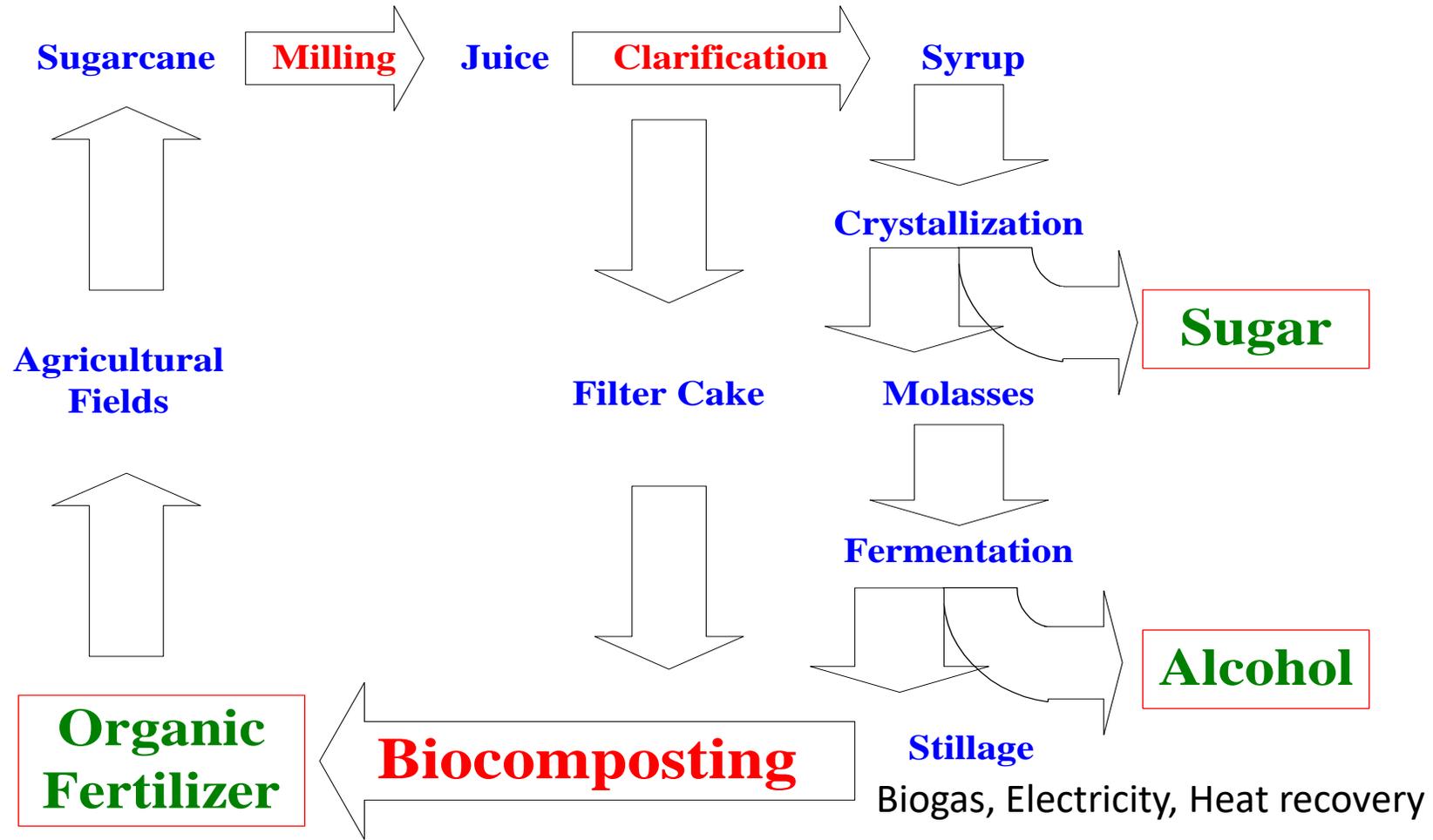
Trash – Fertilization



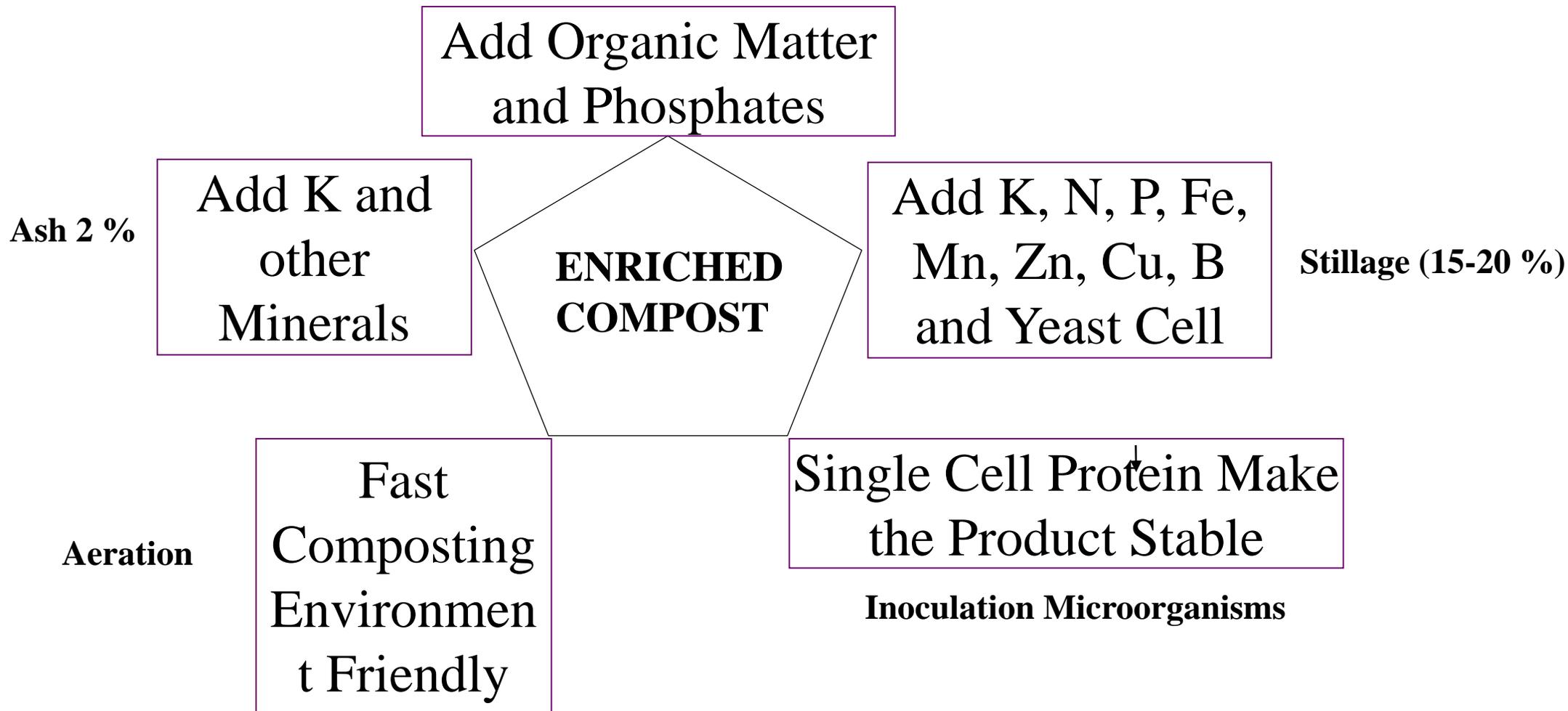
Filter-cake Management



Nature To Nature



Filter Cake (75-80 %)



Pentagon of Enriched Organic Fertilizer/Compost

Composition of Manures (kg/ton)

Manure type	OM	Total N	P₂O₅	K₂O
Chicken Manure (fresh, broiler, layer etc)		13-36	8-40	6-23
FYM		20-25	6-8	5-6
Filter-cake	550- 600	15-16	11-13	7-10

Effect of fertilizers & PM on Cane yield

Practice	Yield (Md/Acre)	Difference (md/Acre)
Farmers Practice	625	--
Recommended fertilizer (NPK, Zn and B)	720	95
Half NPK +Zn and B and 4 ton PM (DWB)	765	140

(Source: Final Report 2004-08 ALP-NIINMS Project, Sugar Crops, PARC)

Effect of Filter Cake on Soil

Treatments	<i>Physio-chemical characteristics of the Sandy loam soil</i>						
	Bulk Density (g cm ⁻³)	pH	EC _e (dS m ⁻¹)	O.M. %	Total N (mg kg ⁻¹)	Avail. P (mg kg ⁻¹)	Avail. K (mg kg ⁻¹)
No PM	1.32	8.1	0.39	0.800	310	8	161
PM 2 t ha ⁻¹	1.32	8.1	0.42	0.816	400	52	186
PM 4 t ha ⁻¹	1.32	8.0	0.42	0.830	460	106	205
PM 10 t ha ⁻¹	1.30	7.9	0.50	0.848	680	220	234

(Ghulam *et al.*, 2010, D.I. Khan)

COMPOSTING vs BIOCOMPOSTING

It is a process to treat FC/FYM/MP/GM
Effluent/Microbes -an environment
Friendly/stable product –
Increase the productivity -
Soils and Plants

Commercial Composting





PREPARATION OF COMPOST BRAZIL : MATURITY PERIOD 40 DAYS.

CONVERSION OF FILTERCAKE INTO COMPOST- BARZIL



COMPOST TURNER AND COMPOST DISTRIBUTOR- BRAZIL



Effect of Enriched Filtercake (*Trichoderma* fungi) and Bio-compost on Sugarcane

Treatments	CCS %	Cane yield t/ha
100% NPK	12.45	84.3
75% NPK	12.49	70.3
75% NPK + EPM-P (10 t/ha)	13.51	86.7
75% NPK + BC (10 t/ha)	13.40	86.0
CD (P=0.05)	NS	9.40**

(Rakkiyappan et al., 2001)





PRESS MUD





Filtercake Management

Production & Application estimate

YEAR	Sugarcane (000 acres)	Production (000 ton)	Estimate (50% area) (ton/acre)
2018-19	2719	1490	1.09
2019-20	2564	1441	1.12
2020-21	2875	1758	1.22
2021-22	3112	2064	1.32



Expected Benefits Filtercake to Compost

Description	Unit
Sugarcane area (2021--22)	2.72 million acres
Filter cake production (3% of total cane crushed) per season	2.01 million tons
Expected Compost production per season	1.00 million ton
Area with half doze of fertilizer (NPK 75-50-50) + 1 ton of compost per acres	1.00 million acres
Reduction in Fertilizer Import bill (Rs)	10.0 billion/Season
Additional benefits per season for both growers and millers	Increase yield (10%) Sugar Rec. 0.5%



Value (FC) to Value Addition (Compost)

- Rich/Cheapest/Readily available Source of OM
- Yield increase, S. Cane (10 %) and Wheat (25 %)
- Physicochemical Properties of soil?
- Reclamation of Problem Soils
- Solubility of salts?
- Decrease pH of Soil?

