

## Bio-slurry (Bs) – Biogas plant digestate concentrate

### Introduction

Digestate or bio-slurry (Bs) is fermented organic material. The product is created through the process of anaerobic digestion (AD). The AD process breaks down carbohydrates, proteins and fats in the ‘feedstock’ and convert this to biogas. What is left is a 100% organic product that contains macro and micro nutrients, carbons and water. Bs is certified to only contain organic material;

Bs concentrate is produced by removing the excess water and retaining around 20-25% of the original volume of the material but close to 100% of the organic material. The reason for reducing the volume is to reduce the transportation cost, reduce storage space requirement and extends product ‘shelf-life’.

In various published studies it is proven that Bs is significantly more efficient than FYM (farm yard manure) and crop production increase is between 6,5% and 20% depending on the cultivar.



Untreated Bio-slurry

### Benefits

Environmental improvement

- ◇ Soil enhancer, soil recovery system
- ◇ Sustainable alternative to chemical fertilizer
- ◇ Reduce build-up of salt in soil

Water usage

- ◇ Reduce water usage per ha due to increase in retention of water in soil as a result of its C/N ratio helping the uptake of N in crops improving the ‘bonding’ characteristic of soil particles.
- ◇ Re-establish and enhance microbial activities in the soil. This is due to higher percentage of available nitrogen which accelerates the N-uptake by plants. This is particularly visible in the early part of the growth cycle.

Crop production

- ◇ Has higher ammonium fraction that is more easily accessible by the crops.
- ◇ Accelerates the N mineralization process due to its good C/N ratio. This, in turn, helps the uptake of N in the crops, improving the ‘bonding’ characteristic of the material with soil particles and therefore reduce leach possibility of the product out of the soil (Ghoneim 2008).

Natural pesticides, fungicides toxic inhibitors

- ◇ Is a natural pesticide and is a good alternative to synthetic pesticides when combating nematode manifestations
- ◇ Alternative to conventional fungicides
- ◇ Reduce or inhibit toxic substances in soils typically for the herbicide atrazine and the insecticide chlorpyrifos.

Energy

- ◇ Bs is energy positive and use 300 times less energy to produce than Synthetic Fertilizer.
- ◇ This can have a very large impact on a macroeconomic scale and significantly reduce GHG, especially in the food-production value chain.
- ◇ Can save fossil fuel energy and related costs.
- ◇ Increasing fossil fuel prices will make fossil fuel based fertilizers’ price more and more expensive and volatile, which will directly impact those smallholder farmers that currently depend on them.

Bs, consists of:

	Liquid fraction of digestate	Solid fraction of digestate
DM%	4	24
Total N (% DM)	7 – 9.2	2.3 – 3.0
Total N (kg Mg <sup>-1</sup> FM)	4.0 – 5.0	4.6 – 6.5
Total NH <sub>4</sub> <sup>+</sup> (kg Mg <sup>-1</sup> FM)	2.0	2.6
NH <sub>4</sub> share on total N (%)	50 – 80	40
Total C (%DM)	3.7 – 4.8	19.3 – 40
C:N ratio	3 – 5	20 – 40
Total P (%DM)	0.8	1.9
Total P (kg Mg <sup>-1</sup> FM)	1	2
Total K (% DM)	3.7	3.8
Total K (kg Mg <sup>-1</sup> FM)	3.7	3.8
Total Mg		0.3
pH	7.6	7.9

Range of other macro- and micro-nutrients: Calcium(Ca), Magnesium(Mg), Iron(Fe), Manganese(Mn), Zinc(Zn); and amino acids and humus  
Information is only as indication product is a natural product and might vary from batch to batch.

Source : NviroTeckLab, 2012Wiley-VCH GmbH&CoKGaA, Weinheim

**Bio slurry application per crop**

Crop	Bio-slurry (Bs) Product	Total volume per season per ha	Dilution ratio			Frequency of application				Special note:
			Soil preparation	1st application	Additional application	Total number of applications	Soil preparation	1st application	Additional application	
Vegetables (general)	Concentrate	6,0	1:20	1:20	1:20	3	2t/ha	2t/ha	2t/ha	1st application/ soil preparation, 2nd after emergence 3rd just before flowers, Stop fertilizing once flower/ fruit appears
Potatoes	Concentrate	0,6	1:50	na	na	1	0,6t/ha	Apply 1 x only as nutrients are used in early growth stage, do not over fertilize as this will lead to higher stage production in potato's and slower growth	25t/ha	
	Digestate	5	1:5				5t/ha			
	Liquid fraction	25	1:1							
Lucerne	Concentrate	2,4	1:10	1:40	1:40	8	0,3t/ha	0,3t/ha	6 x 0,3t/ha	Further applications after every cut up to 6-8 cuts per season
	Digestate	20	1:1	1:1	1:1	8	2,5 t/ha	2,5 t/ha	2,5t/ha	
Grass (garden/ golf)	Concentrate	0,6	1:50	1:50	1:50	8	0,075t/ha	0,075t/ha	6 x 0,075t/ha	Further applications every 4 weeks, after cuts 8 applications
	Liquid fraction	5	1:1	1:1	1:1	8	0,625t/ha	0,625t/ha	0,625t/ha	
Maize, sun-flower, canola	Concentrate	6,0	1:50	1:50	1:50	4	1,5t/ha	1,5t/ha	2 x 1,5t/ha	1st application after harvesting, 2nd application before planting, 3rd 1 week after emergence and #4 final at or before week 6
	Digestate	50	1:1	1:1	1:1	4	20t/ha	10t/ha	2 x 10t/ha	
Oats , Wheat, Rye	Concentrate	3,6	1:20	1:50	1:50	3	1,2t/ha	1,2t/ha	1,2t/ha	1st application soil preparation, after 1 week from emergence, final at or before week 3
	Digestate	30	1:1	1:1	1:1	3	20t/ha	5t/ha	5t/ha	
Soya beans	Concentrate	3,0	1:30	1:40	1:40	3	1t/ha	1t/ha	1t/ha	1st application/ soil preparation, 2nd application after emergence (leaves) , final after week 2 but before flower/ fruit appears.
	Digestate	25	1:3	1:4	1:4	3	10t/ha	10t/ha	5t/ha	

**Note:**

Being a natural product Bs needs to be applied more frequently than chemical fertilizer. The coverage per ha is dependent on the crop type and the concentrate level of the Bs. Bio Slurry needs to be diluted before use, dilution can be between 10 times or up to 40 times. (1:10 for each litre of Bs you need to add 10 litres of water). Application volumes can vary between 50t/ha per season for irrigated fields and 5t/ha dry land. The data below is a guide and does not take into consideration soil type and condition alterations/ variations needs to be made to achieve optimal production.

\*ton/ha – shown is a cumulative volume per season, (total application over the season) that will ensure sufficient fertilization. Users should keep the maximum N that is allowed to be applied in the season in mind. Different to chemical or synthetic fertilizer Bs cannot be over fertilized and cause soil degradation.

**Reference:**

Various international studies has shown that Bio Slurry has several benefits and are more beneficial than FYM

Bio-slurry Brown Gold?, A review of scientific literature on the co-product of biogas production; Food and Agriculture Organization of the United Nations, - 00153 Rome, Italy

Biogas Slurry: Source of Nutrients for Eco-friendly Agriculture; Sandeep Kumar\*, Lal Chand Malav, Mahesh Kumar Malav and Shakeel A Khan, Centre for Environment Science and Climate Resilient Agriculture, Indian Agricultural Research Institute, New Delhi 110012 India

Warnars, L. (2013). Bioslurry: the new brown gold? Bioslurry manual. Hivos, 2013.

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