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Research Article

Solid Waste Management and Search for Alternate Procedures of Waste Treatment, Recycling and Management

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Abstract*:*
The composition of solid waste is found by collecting samples of solid waste at seven collecting places in the city. The waste is classified and the percentage of individual components paper, plastic, organic matter, glass, etc. are found. The charts show the percentages of all components and the organic matter is measured at 40 to 60%. The raw organic matter collected from the local vegetables market is a mix of partially decomposed vegetables viz tomato, brinjal, potatoes, green leaves etc. is finely ground and converted to paste form and subjected to aerobic decomposition. To promote the aerobic decomposition by bacteria's a small amount of black cotton soil, cow dung, phosphate buffer, manganese sulphate, etc. are added and thoroughly mixed with organic matter and the whole mixture is subjected to oxidation. Different combinations chosen are shown in table no's 8, 10, 12, 14 and 16 below. The samples are kept under observation and It was found, after seven days the decomposition gradually reduced and completed by around tenth day, beyond which weight became constant manifesting total conversion of organic matter in to minerals. As oxidation progressed, the offensive odor of the organic matter decreased steadily. The color of the sample turned to greyish black. To make the study useful for agricultural applications, the foliage of gliricidiasepium and avenue trees are also included in the decomposition process. The completely digested organic matter sample is sent to the University of Agricultural Sciences, to evaluate for its fertility value. The report from the university shows percentage NPK values rightly fulfill the status of manure. Further the Paper and cloth waste are converted in to bags, pen stands and other desktop items.

Keywords:Solidwaste,organic,aerobic, glyricidia,avenue,nitrogen,phosphorous, manure.

Introduction

Solid Waste management is a global menace whichhas challenged almost all the countries on the earth. Themagnitude of the problem is very huge as thousands oftons of solid waste is released by the society every day.The treatment of the solid waste is very complex as itscomposition continuously changes from place to placeand also with time. Hence the treatment approaches are differentfordifferentwastecomponentsproduced in acity.

This project work is taken up as a case study, toprovidesomesimplemethodsoftreatmentandrecycling of organic waste and other wastes. The casestudy is done in Ballari city, Karnataka, India (latitude15^{0}Nandlongitude76^{0}E,Dailymeantemperature: 26.52^{0}C,Averagetemperature:32.22^{0}C,Averageprecipitation recorded is 651.7mm,Averagerelativehumidity:57%). The project focuses mainly on the organic wastegeneratedfromvegetablemarkets,paperandclothwastes. The organic waste is the waste which can beconvertedtoinorganicminerals byadoptingsuitabledecomposition methods. The benefits after

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conversionare multifold because the manure which is obtained isusable directly for agriculture or can be sold as a
fuel.Theprojectalsoincludesotherorganicformssuchasglyricidialeaves,avenueleaveswhichareusedinpractices ince ancient times toincreasethefertilityand productivity ofthesoil in agriculture.
As perthe literature the optimum percentages of Nitrogen(N), Phosphorous (P) and Potassium (K) for
a fertile soilare respectively 1.32-2.01, 0.03-1.98 and 1.18-1.62. It
isknownthatcompostingisastabilizationprocess
oforganicmatterwhichusesearthwormsforthestabilizationof the organic material.But this methodneedsa little
longertime up to 30daysto
45daysforthedecomposition.Butinthecurrentstudythemethodologyadoptedis
acceleratedaerobicdecomposition where the organic matter from the solidwaste is mixed with a few selected other
materials suchascow dung(dry),phosphatebuffer,manganesesulphate, calcium chloride, ferric chloride, etc and the
study is made. The
keyingredientusedinthestabilizationprocessissimpledomesticsewage.Alltheingredientsare mixedthoroughly and placed in a very well aerated &ventilated openplace. The effect of ill solid waste management
on theenvironmentand humanhealthhasbeendiscussedwellby **EbnaForhadMondol**[3]etallintheirpaper entitled“SolidWaste
ManagementStrategy&ImprovementofExistingScenarioBasedonMarketWaste”clearly.
Abdilatif Hussein Omar, Mohd Bakri Ishak[2] intheir paper on “ An Analysis of Households“ Attitude towards
Solid Waste Segregation and Recycling Practices inBandar Tun Razak, Kuala Lumpur, Malaysia” have
identified& discussed clearly about house hold problems of wastemanagement and its relation to other social
factors.

CaseStudy:BallariCity:

EXPERIMENTAL PROGRAMME:

Solid waste management of few selected colonies in Ballaricity.
Areasunderconsideration,are:

1. ParvathiNagar.
2. GandhiNagar.
3. NehruColony.
4. KalammaStreet.
5. CowlBazar.

Figure. No.1: Ballaricitymap-selectedareas

SamplingMethodology:

As plannedin thestudy,samples were collected in the selected areas of the city and brought to laboratory for further classification and are segregated and weighed. Fivesampling points were considered as shown in the map above. The size of thesample varied between 3-5 kgs. Sampling is made everyalternativedayanditis donefor a week account for the variations in the type of solidwaste dumped in the respective dumpingareas.

Selection of Samplingpoints is made considering the following factors: -

- Quantity ofaccumulated solidwaste.
- Population ofthearea.
- Number of Commercial units like Educational institutions, hotels, etc.withinthearea.
- Sanitation importance ofthearea

2.1 ParvathiNagar-BasavaBhavan:

Compositionofsolidwastenear BasavaBhavan, Parvathinagar,isshowninTableNo.1.

TableNo.1: Composition ofsolid wastenearBasavaBhavan,Parvathinagarcolony.

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (30/04/2014) (14:00)	*Day2 (01/05/2014) (14:00)*	*Day3 (03/05/2014) (14:00)*	*Day1 (30/04/2014) (14:00)*	*Day2 (01/05/2014) (14:00)*	*Day3 (03/05/2014) (14:00)*
1	Paper	1.1	0.46	0.63	23.66	10.02	15.14
2	Glass	0.05	2.2	1.62	1.08	47.93	38.94
3	Plastic	1.25	0.62	0.71	26.88	13.51	17.07
4	OrganicMaterial	1.75	0.69	0.65	37.63	15.03	15.63
5	Cloth	0	0.24	0.31	0	5.23	7.45
6	Soil	0.5	0.38	0.24	10.75	8.28	5.77
7	Demolishedwaste	0	0	0	0	0	0
	TotalinKgs	4.65	4.59	4.16	-	-	-

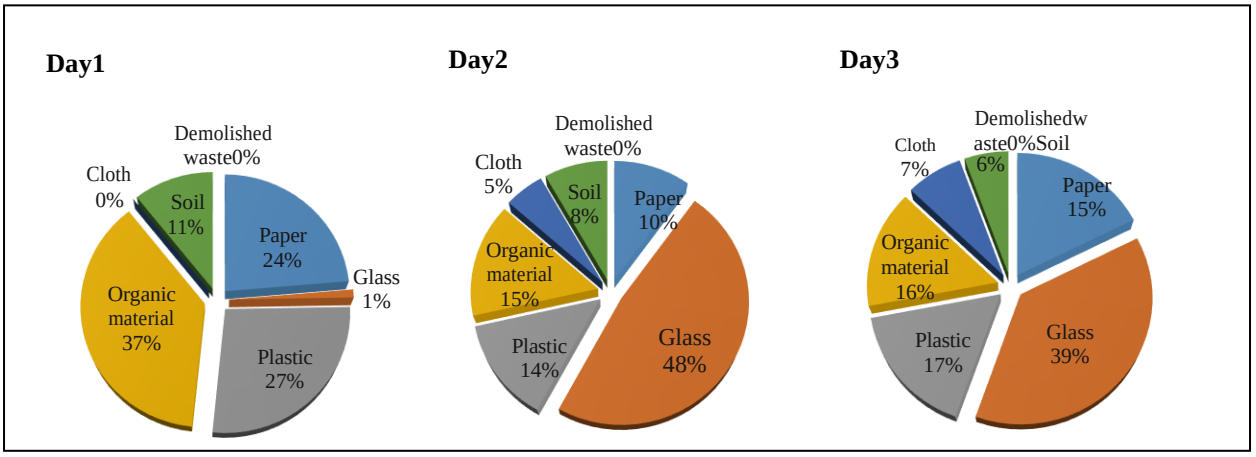
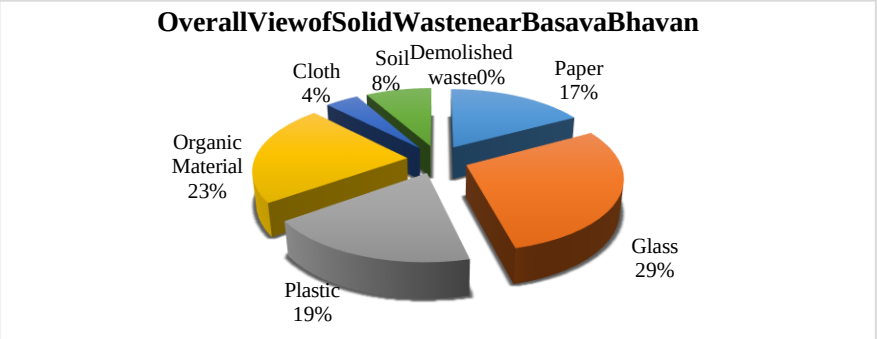


Figure No.2: Piechart showingcompositionofthesolidwaste



FigureNo.3: Piechart showingoverallcompositionofsolidwastenearBasavaBhavan, Parvathinagar

2.2 ParvathiNagar-PoliceGymkhana:

Composition ofsolidwaste at PoliceGymkhana, Parvathinagar,isshowninTableno.2.

TableNo.2: Composition ofsolidwastenearPoliceGymkhana,Parvathinagararea

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (29/03/2014) (06:30)	*Day2 (31/03/2014) (06:30)*	*Day3 (02/04/2014) (06:30)*	*Day1 (30/04/2014) (14:00)*	*Day2 (01/05/2014) (14:00)*	*Day3 (03/05/2014) (14:00)*
1	Paper	0.25	0.37	0.32	8.06	10.51	9.41
2	Glass	1.2	1.15	0.98	38.71	32.67	28.82
3	Plastic	0.8	0.86	0.82	25.81	24.43	24.12
4	OrganicMaterial	0.45	0.56	0.69	14.52	15.91	20.29
5	Cloth	0.15	0.2	0.26	4.84	5.68	7.65
6	Soil	0.25	0.38	0.33	8.06	10.80	9.71
7	Demolishedwaste	0	0	0	0	0	0
	TotalinKgs	3.1	3.52	3.4	-	-	-

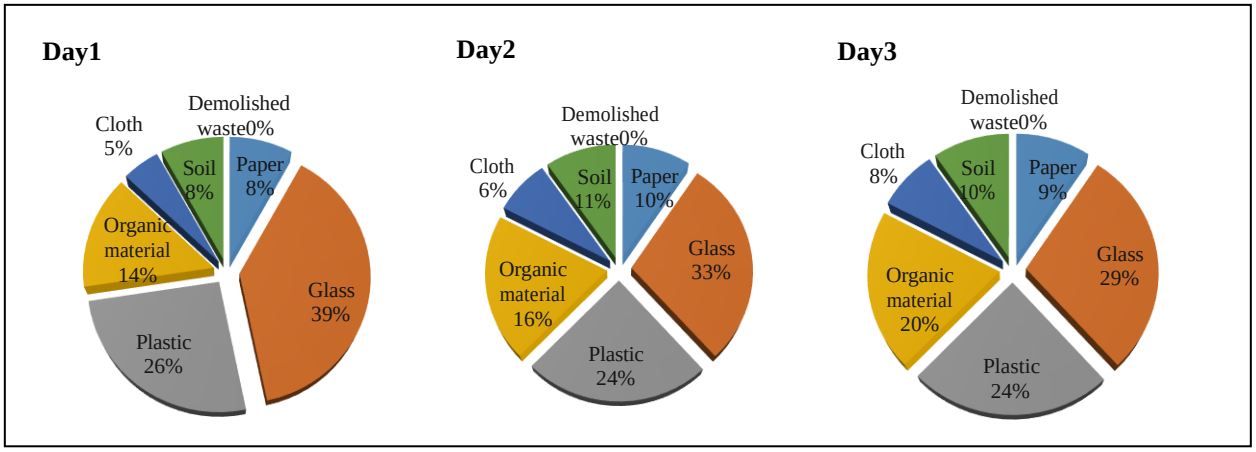


Figure No.4: Piecharts showingcompositionofthesolidwaste

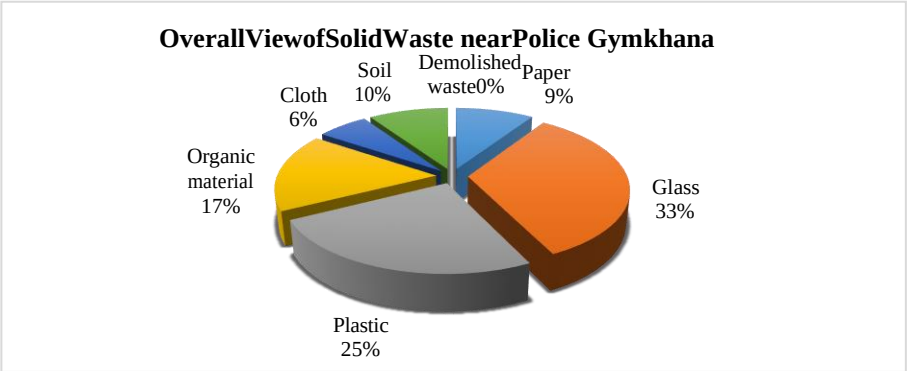


Figure No.5: PiechartshowingoverallcompositionofsolidwastenearPoliceGymkhana, Parvathinagar

GandhiNagar-ChaitanyaCollege:

Composition of the solid waste atChaitanya College, GandhiNagar,isshownin TableNo.3.

TableNo.3: Compositionofsolidwasteat ChaitanyaCollege,GandhiNagararea

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (10/04/2014) (06:30)	*Day2 (12/04/2014) (06:30)*	*Day3 (14/04/2014) (06:30)*	*Day1 (10/04/2014) (06:30)*	*Day2 (12/04/2014) (06:30)*	*Day3 (14/04/2014) (06:30)*
1	Paper	0.15	0.48	0.36	6.70	13.56	10.40
2	Glass	0.45	0.92	0.84	20.09	25.98	24.28
3	Plastic	0.30	0.39	0.42	13.40	11.04	12.16
4	OrganicMaterial	1.00	1.20	1.18	44.64	33.90	34.10
5	Cloth	0.03	0.12	0.16	1.34	3.38	4.62
6	Soil	0.045	0.18	0.12	2.00	5.08	3.46
7	Demolishedwaste	0.265	0.25	0.38	11.83	7.06	10.98
	TotalinKgs	2.24	3.54	3.46	-	-	-

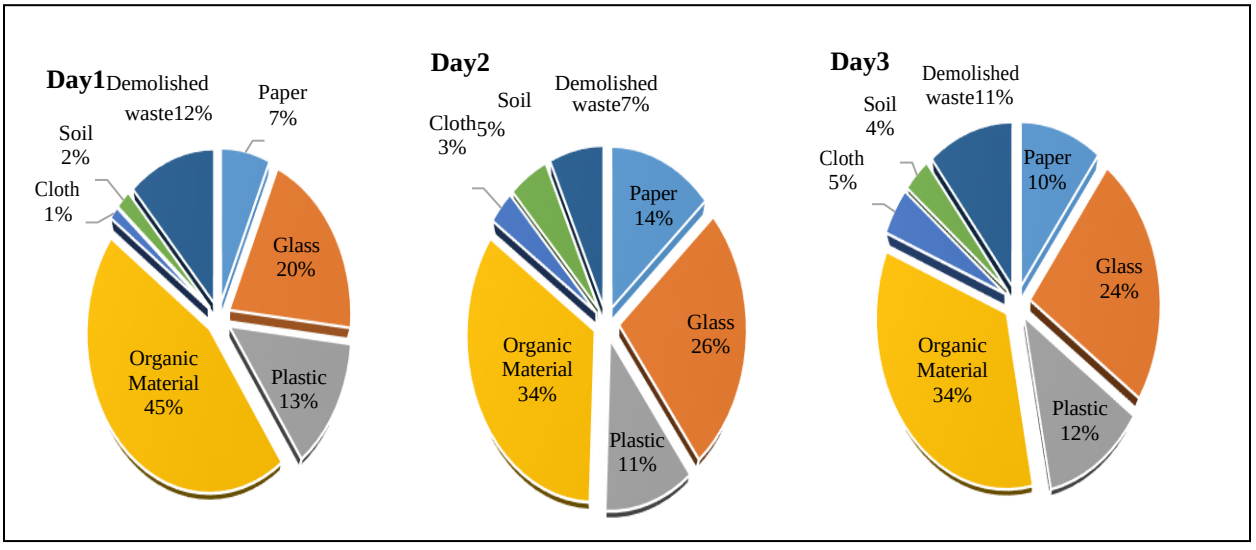
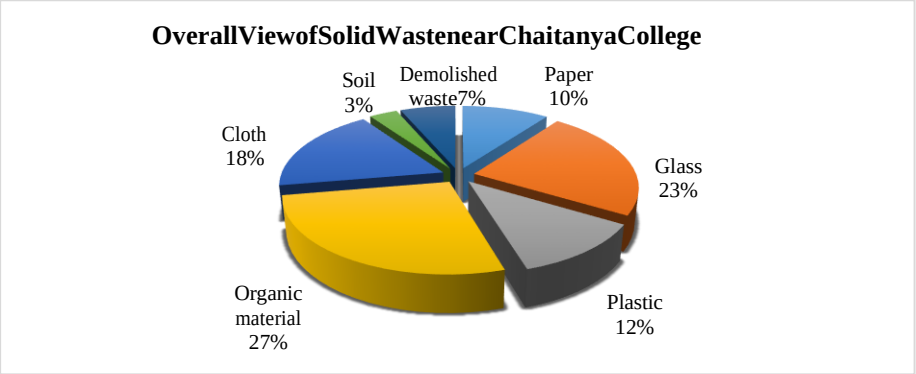


Figure No.6: Piecharts showingcompositionofthesolidwaste



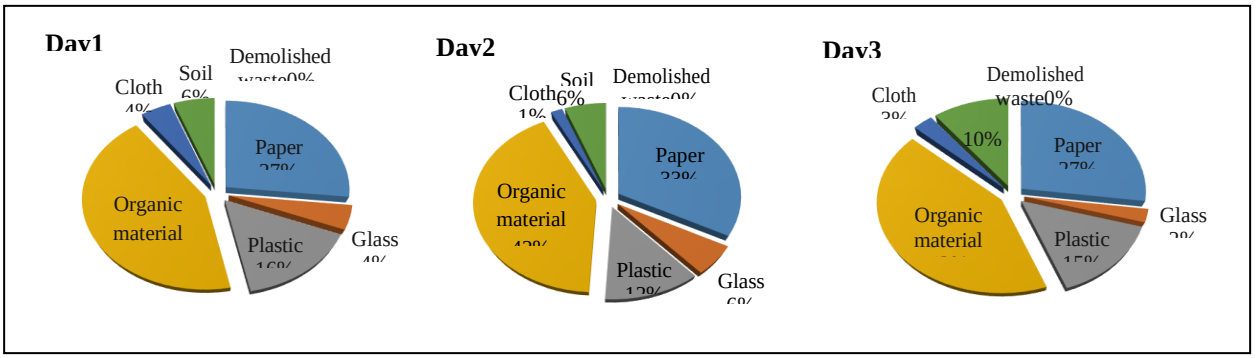
FigureNo.7: Piechart showingoverallcompositionofsolidwastenearChaitanya College,GandhiNagar

2.3 GandhiNagar-Market area:

Composition of the solid waste at Market place, Gandhi Nagar,isshowninTableNo.4.

Table No.4: Composition ofsolid wastenearMarket,GandhiNagar

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (05/04/2014) (11:00)	*Day2 (07/04/2014) (11:00)*	*Day3 (09/04/2014) (11:00)*	*Day1 (05/04/2014) (11:00)*	*Day2 (07/04/2014) (11:00)*	*Day3 (09/04/2014) (11:00)*
1	Paper	1.20	1.80	1.36	26.73	32.72	27.31
2	Glass	0.20	0.32	0.12	4.45	5.82	2.41
3	Plastic	0.70	0.68	0.73	15.59	12.36	14.66
4	OrganicMaterial	1.95	2.30	2.12	43.43	41.82	42.57
5	Cloth	0.19	0.09	0.14	4.23	1.64	2.81
6	Soil	0.25	0.31	0.51	5.57	5.64	10.24
7	Demolishedwaste	NIL	NIL	NIL	NIL	NIL	NIL
	TotalinKgs	4.49	5.50	4.98	-	-	-



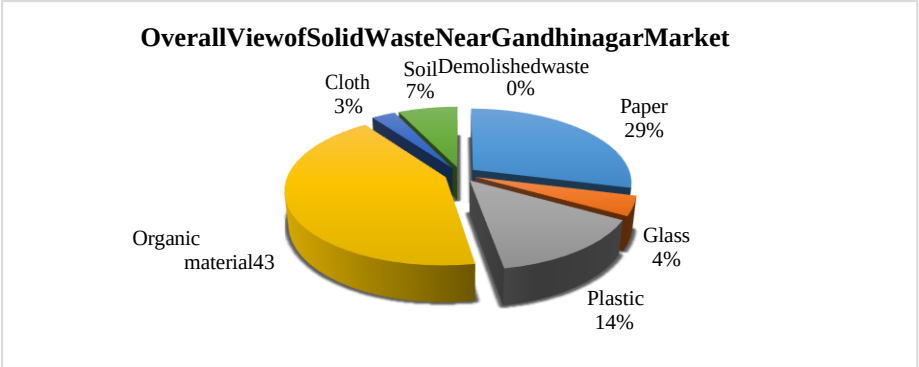


Figure No.8: Piechart showingcompositionofthesolidwaste

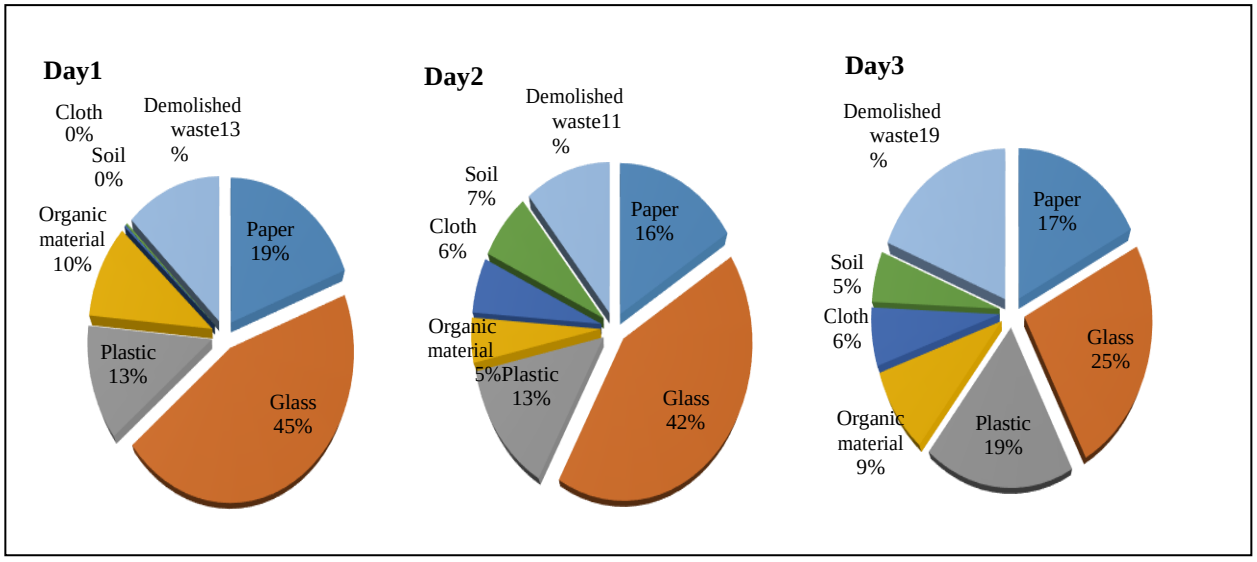
FigureNo.9: Piechart showingoverallcompositionofsolidwastenearMarket,GandhiNagar

2.4 NehruColony

Composition of the solid waste sampled at three different locations in Nehru Colony, Ballari isshownintable5.

Table No5: CompositionofsolidwastenearNehruColonyarea

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (04/04/2014) (06:30)	*Day2 (06/04/2014) (06:30)*	*Day3 (08/04/2014) (06:30)*	*Day1 (04/04/2014) (06:30)*	*Day2 (06/04/2014) (06:30)*	*Day3 (08/04/2014) (06:30)*
1	Paper	0.75	0.73	0.69	19.13	16.11	17.47
2	Glass	1.75	1.90	0.98	44.64	41.94	24.81
3	Plastic	0.50	0.61	0.73	12.76	13.47	18.48
4	OrganicMaterial	0.40	0.21	0.35	10.20	4.64	8.86
5	Cloth	0.01	0.26	0.24	0.26	5.74	6.08
6	Soil	0.01	0.32	0.21	0.26	7.06	5.32
7	Demolishedwaste	0.50	0.50	0.75	12.75	11.04	18.98
	TotalinKgs	3.92	4.53	3.95	-	-	-



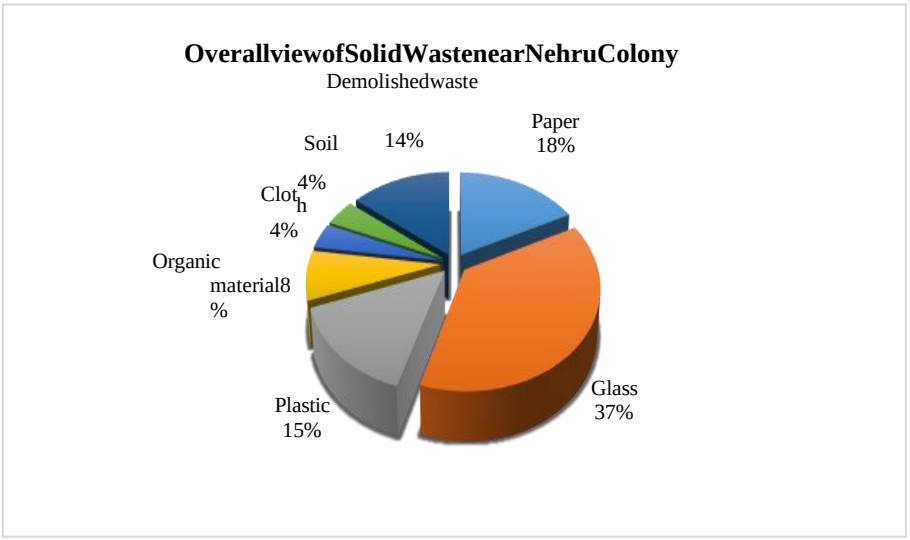


Figure No. 10: Piecharts showingcompositionofthesolidwaste

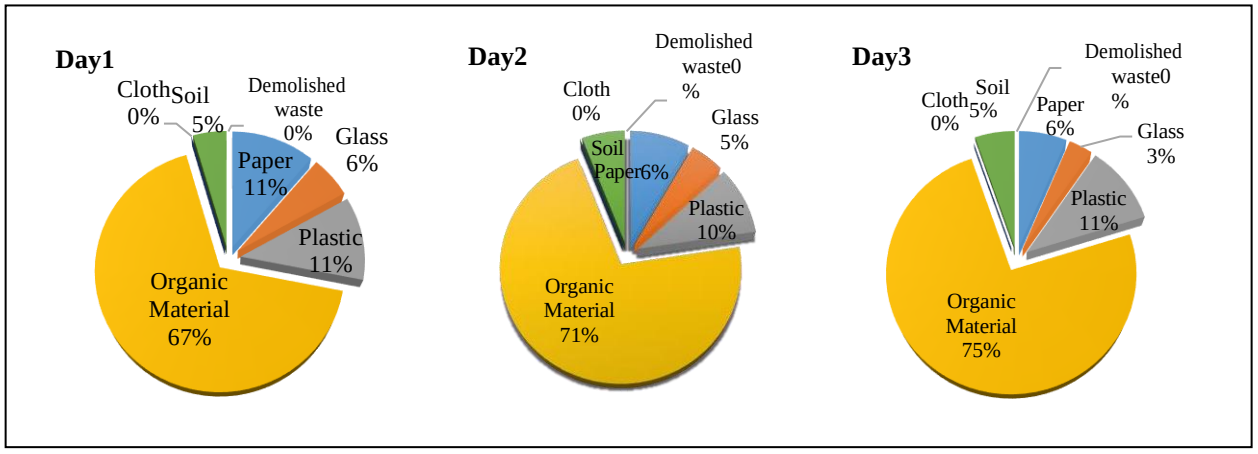
FigureNo.11: PiechartshowingoverallcompositionofsolidwastenearNehruColony

2.5 Kalama Street

Composition of the solid waste collected at three different locations, Kalama Street, Ballari isshownintable2.1.

TableNo.6: CompositionofsolidwastenearKalamaStreetarea

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (11/04/2014) (11:30)	*Day2 (13/04/2014) (11:40)*	*Day3 (15/04/2014) (11:30)*	*Day1 (11/04/2014) (11:30)*	*Day2 (13/04/2014) (11:40)*	*Day3 (15/04/2014) (11:30)*
1	Paper	0.50	0.35	0.30	11.24	8.33	6.38
2	Glass	0.25	0.20	0.15	5.62	4.76	3.19
3	Plastic	0.50	0.40	0.50	11.24	9.52	10.64
4	OrganicMaterial	3.00	3.00	3.50	67.42	71.43	74.47
5	Cloth	NIL	NIL	NIL	NIL	NIL	NIL
6	Soil	0.20	0.25	0.25	4.49	5.95	5.32
7	Demolishedwaste	NIL	NIL	NIL	NIL	NIL	NIL
	TotalinKgs	4.45	4.20	4.70	-	-	-



FigureNo.12: Piecharts showingcompositionofthesolid waste

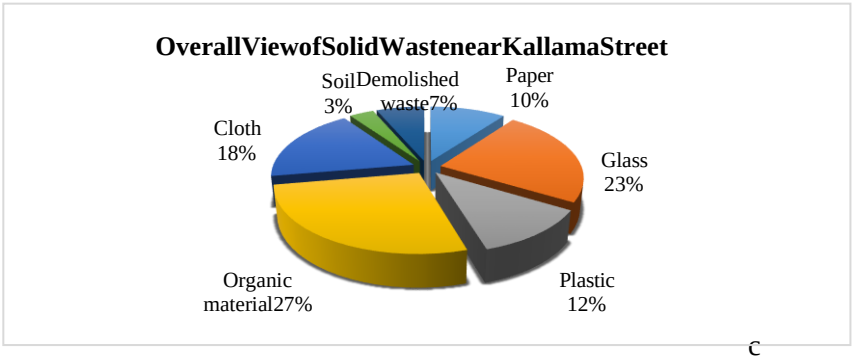


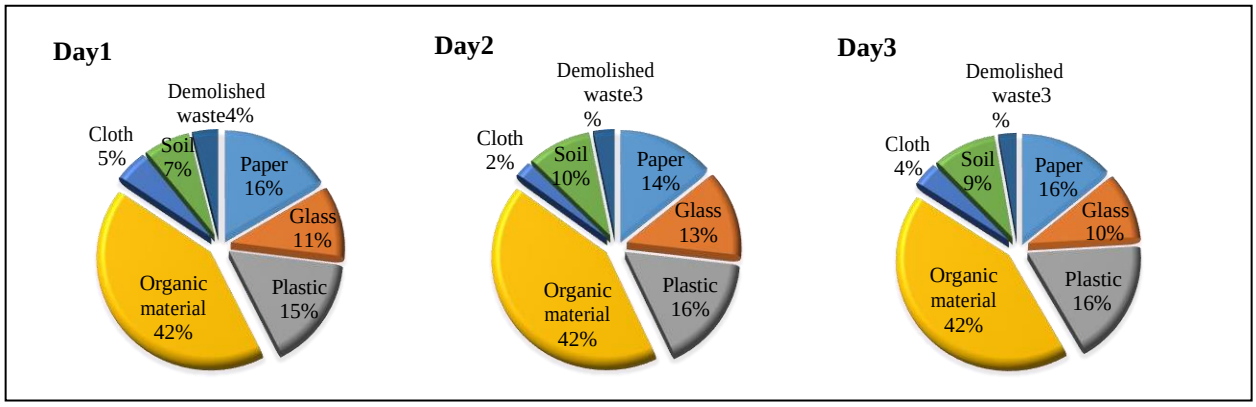
Figure No.13: PiechartshowingoverallcompositionofsolidwastenearKalamaStreet

2.6 CowlBazar

Composition of the solid waste at three different locations in Cowl Bazar, Ballari is shownTableNo.7.

TableNo.7: CompositionofsolidwastenearCowlBazar

SI No.	*Components*	*ComponentsofwasteinKg*			*Percentageofcomponents,%*		
		Day1 (10/04/2014) (06:30)	*Day2 (12/04/2014) (06:30)*	*Day3 (14/04/2014) (06:30)*	*Day1 (10/04/2014) (06:30)*	*Day2 (12/04/2014) (06:30)*	*Day3 (14/04/2014) (06:30)*
1	Paper	0.86	0.72	0.76	16.38	14.06	15.83
2	Glass	0.56	0.66	0.45	10.67	12.89	9.37
3	Plastic	0.82	0.83	0.79	15.61	16.22	16.46
4	OrganicMaterial	2.20	2.15	2.10	41.90	41.99	43.75
5	Cloth	0.25	0.12	0.16	4.78	2.34	3.34
6	Soil	0.36	0.48	0.42	6.85	9.38	8.75
7	Demolishedwaste	0.20	0.16	0.12	3.81	3.12	2.50
	TotalinKgs	5.25	5.12	4.80	-	-	-



FigureNo.14: Piecharts showingcompositionofthesolid waste

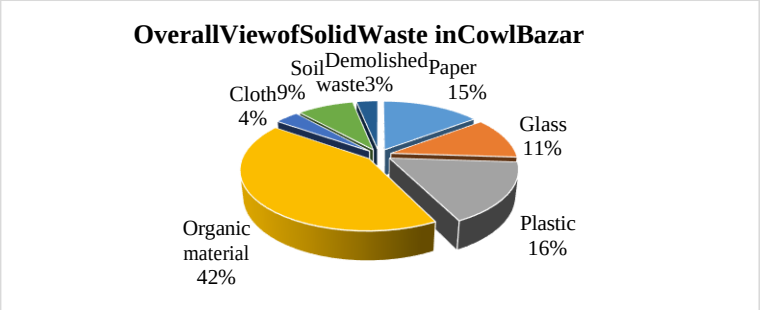


Figure No.15: Piechart showingoverallcompositionofsolidwastenearCowlBazar

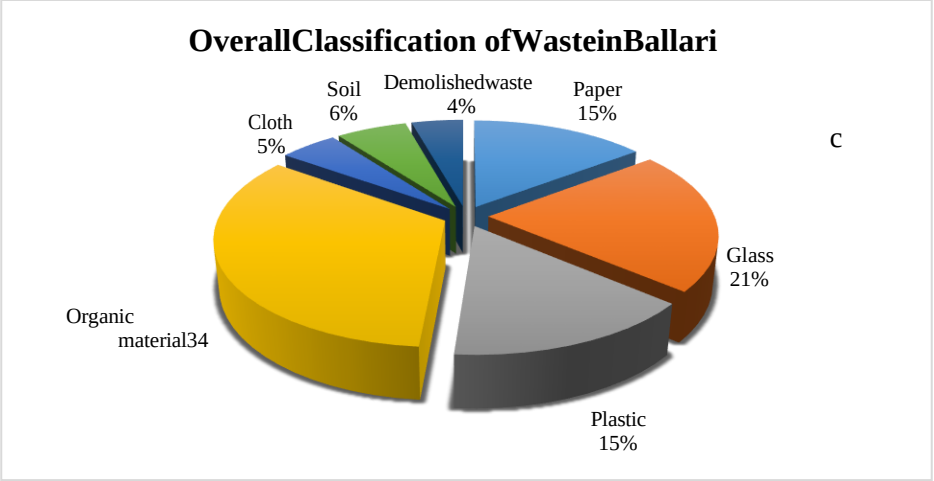


Figure no.16: Piechartshowingoverallcompositionofsolidwasteinballari

2. Alternate Treatment methods:

The wastes considered are:

1. OrganicMatter.
2. Paper, cloth and fibrous Waste.

3.1 Organicmatter:

Methodologyconsideredforinvestigationofconvertingorganic matterinto manureby acceleratedecompositiontechnique is described below:

3.1.1 Accelerated decomposition of organic matter byaerobicdecomposition:

Asplannedbefore inthisprojectworktoidentifynovel andinnovativevery simple methodsortechniques to accelerate biologicaldecompositionofwasteandvegetableorganic matterbyaerobic method taken up is elaborately presented here:

Any organic matter (dominantly carbonaceous)will undergo decompositionandgetsconverted to inorganic minerals as a result of decompositionovera length of time. The speed and the rate of conversionto inorganic status depends on two factors, viz availability ofplenty of oxygen and right species and a large number ofmicroorganisms presentwithorganicmatter.

The Organicmatter, is placed in a container/tray and is seeded withjust enough quantity of sewage containing plenty of Bacterial population andprovided with sufficientatmosphericoxygenand placed in a well-ventilated room. This is to conceive a formof biologicalreactorforrapiddecompositionoforganicmatter.

The rate of decomposition of organic matter also dependsupon the physical condition of the matter such as temperature. grain size, aeration etc. It is obvious thatfiner or fragmented the organic matter is, the faster will bethe decomposition as microorganisms get easy access to thefood.

Some trial or pilot studies were made and the results werefoundencouraging.

The procedure adopted is waste organic matter taken fromthe city is fragmented to thessize of approximately “0.5mm” and below. Thensufficient(25mlofsewageperkilogramoforganicwaste)strongdomesticsewage from the city is addedand is mixed thoroughly withtheorganicmatter and many other ingredients as described below.

Then thewhole mixture isplaced insuch away that itiswellaeratedfromatmosphericoxygen.Thentheobservationsweremadeeverydayandtheweightsarere corded.Thedropintheweightisobservedandthepercentagedropisfoundas 11%everyday.

Thisway daily observationsweremadeand afteraround “**12 days**” the weight became constant. We

alsofoundtheoffensiveodorof organic matter presentinthebeginningcontinuously decreasingeveryday,whichisanindicationofactivedecompositionoforganicmatterandits mineralization.

With this study we come to an important understanding thatthesewagecanbetakenasanimportant additivetotreatvegetable waste organic matter. The reasons are as sewagecontains millions of bacteria of allkinds, are responsiblefortherapidconversionoforganicmatterintomineralswhichwecallas "**manure".**

If the same procedure is made to occur at suitable elevatedtemperatures, the rate of mineralization of the organic mattermay be still higher. Further, it is also planned in the study to include foliage ofGrislenia and Avenue tree (In local Dialect language, Kannada known asHONGE tree, applied during ploughing in agricultural fields to make soil more fertile/productive) with other organic matter during decomposition process.

Several combinations of materials are tried in the study and are explained below:

Combination 1: vegetable organic matter + black cotton soil

+cowdung(dry)+phosphatebuffer+manganesesulphate
+calciumchloride+ ferricchloride+sewage

Table No.8: Observations recorded on the change in the weightof the sample with time:

SI No.	*Day*	*Date (DD/MM/YY)*	*Weight of theSample (gms)*	
1	Saturday	01/02/2014	823(originalweight)	
2	Sunday	02/02/2014	803	
3	Monday	03/02/2014	794	
4	Tuesday	04/02/2014	783	
5	Wednesday	05/02/2014	769	
6	Thursday	06/02/2014	764	
7	Friday	07/02/2014	763	Weigh tremain edCons tant
8	Saturday	08/02/2014	763	
9	Sunday	09/02/2014	763	

Table No.9: Percentage of Nitrogen, Phosphorous andPotassium recorded after stabilization

SI No.	*Parameter*	*Sample Reading*
1	Nitrogen (N)%	2.01
2	Phosphorous(P)%	1.98
3	Potassium(K)%	1.18

Combination 2: vegetable organic matter + avenue tree leaves +cowdung(dry)+blackcotton soilphosphate+sewage

Table No.10: Observations recorded on the change in theweight of the sample with time as the stabilization of thewastecontinues

SI No.	*Day*	*Date (DD/MM/YY)*	*Weight of theSample (gms)*
1	Friday	21/03/2014	677(originalweigh

			t)
2	Saturday	22/03/2014	605
3	Sunday	23/03/2014	536
4	Monday	24/03/2014	428
5	Tuesday	25/03/2014	422
6	Wednesday	26/03/2014	418
7	Thursday	27/03/2014	418
8	Friday	28/03/2014	418

Table No.11: Percentage of Nitrogen, Phosphorous and Potassium recorded after complete stabilization of the Organicmatter.

SI No.	*Parameter*	*SampleReading*
1	Nitrogen (N)%	1.89
2	Phosphorous(P)%	0.07
3	Potassium(K)%	1.59

Combination 3: vegetable organic matter + avenue tree leaves +glyricidia leaves + cow dung (dry) + black cotton soil +sewage:

Table No.12: Observations recorded on the change in theweight of the sample with time as the stabilization of thewaste

SI No.	*Day*	*Date (DD/MM/YY)*	*Weight of theSample (gms)*
1	Friday	21/03/2014	1007(originalweight)
2	Saturday	22/03/2014	956
3	Sunday	23/03/2014	847
4	Monday	24/03/2014	798
5	Tuesday	25/03/2014	798
6	Wednesday	26/03/2014	798
7	Thursday	27/03/2014	798
8	Friday	28/03/2014	798

Table No.13: Percentage of Nitrogen, Phosphorous andPotassium recorded after stabilization:

SI No.	*Parameter*	*SampleReading*
1	Nitrogen (N)%	1.23
2	Phosphorous(P)%	0.03
3	Potassium(K)%	1.47

Combination 4: vegetable organic matter + glyricidia leaves +cowdung(dry)+blackcottonsoil+sewage

Table No.14: Observations recorded on the change in theweight of the sample with time after stabilization.

SI No.	*Day*	*Date (DD/MM/YY)*	*Weight of theSample (gms)*
1	Friday	21/03/2014	966(originalweight)
2	Saturday	22/03/2014	890
3	Sunday	23/03/2014	742
4	Monday	24/03/2014	568
5	Tuesday	25/03/2014	544
6	Wednesday	26/03/2014	538
7	Thursday	27/03/2014	535
8	Friday	28/03/2014	535

Table No.17: Percentage of Nitrogen, Phosphorous and Potassium recorded after stabilization:

SI No.	*Parameter*	*SampleReading*
1	Nitrogen (N)%	1.32
2	Phosphorous(P)%	0.07
3	Potassium(K)%	1.48

Combination *5:Avenuetreeleaves+glyricidialeaves+cowdung(dry)+blackcottonsoil+sewage*

Table No.18: Observations recorded on the change in the weight of the sample with time as the stabilization of the waste continues:

SI No.	*Day*	*Date (DD/MM/YY)*	*Weight of theSample (gms)*
1	Friday	21/03/2014	690(originalweight)
2	Saturday	22/03/2014	595
3	Sunday	23/03/2014	476
4	Monday	24/03/2014	416
5	Tuesday	25/03/2014	414
6	Wednesday	26/03/2014	414
7	Thursday	27/03/2014	414
8	Friday	28/03/2014	414

TABLE No. 19: Percentage of Nitrogen, Phosphorous and Potassium recorded after complete stabilization.

SI No.	*Parameter*	*SampleReading*
1	Nitrogen (N)%	1.72
2	Phosphorous (P)%	0.12
3	Potassium(K)%	1.62

Whatis the connotation of NPK??

- Chemicalfertilizersandorganicfertilizersshowtheirnutrientcontentwiththreeboldnumberson

thepackage.

- Thesenumbersrepresentthreedifferentcompounds:Nitrogen,Phosphorous,andPotash(Potassium), which we can also describe with theletters N-P-K. The three numbers listed on fertilizerlabelscorrespondtothepercentageofthesematerials foundinthefertilizer.
- What does each nutrient do? In addition to otherproperties, **Nitrogen** helpsplantfoliagetogrowstrong.
- **Phosphorous** helpsrootsandflowersgrowanddevelop.

Potassium (Potash) is important for overall planthealth.

NOTE: Be aware that high nitrogen fertilizers will make for quickgrowth,butweakerplantsthataremoresusceptible toattacksby diseasesand pests.Fast,showy growthis notnecessarilythebestthingforyourplants.

Greenleafmanure:

TableNo.20:

Pongamia glabra	(N)3.2	(P) 0.3	(K)1.3
Glyricidiamaculeata	(N)2.9	(P)0.5	(K)2.8
AzadirachtaIndica	(N)2.8	(P)0.3	(K)0.4
Calatropisgigantecum	(N)2.1	(P)0.7	(K)3.6

TableNo.21: Permissible Limits of few selected minerals & metals suitable for plant growth:

Nutrient	*Low*	*Marginal*	*Sufficient*	*High*	*Excess*
Nitrogen(N)%(Summer)	1.50	1.50-2.00	2.00-3.00	3.00-4.00	4.00
Nitrogen(N)%(Winter)	1.25	1.25-1.75	1.75-3.00	3.00-4.00	4.00
Phosphorous(P)%	0.15	0.15-0.25	0.26-0.50	0.50-0.80	0.80
Potassium(K)%	1.00	1.00-1.50	1.50-3.00	3.00-5.00	5.00
Sulphur(S)%	0.10	0.10-0.15	0.15-0.40	0.40-0.80	0.80
Calcium(Ca)%	0.10	0.10-0.20	0.20-1.00	1.00-1.50	1.50
Magnesium(Mg)%	0.10	0.10-0.15	0.15-0.50	0.50-1.00	1.00
Zinc(Zn)ppm	10.0	10.0-15.0	15.0-70.0	70.0-150	150
Copper(Cu)ppm	2.30	2.30-3.70	3.70-25.0	25.0-50.0	50.0
Iron(Fe)ppm	15.0	15.0-20.0	20.0-250	250-500	500
Manganese(Mn)ppm	10.0	10.0-15.0	15.0-100	100-250	250
Boron(B)ppm	3.00	3.00-5.00	5.00-25.0	25.0-75.0	75.0
Molybdenum (Mo)ppm	0.01	0.01-0.02	0.03-5.00	5.00-10.0	10.0

3.2 Recyclingof paper, cloth and fibrouswaste:

From the various samples collected from the city we foundthe percentage of paper and cloth waste was between 15-20% of thetotal waste collected.It is planned in the present work to recycle paper & cloth waste by making paper bags and decorative items and present inthemarket. Firstly, the paper collected from waste heaps are washed thoroughly in ahuge tub. Both wastes are soaked for ten minutes in thewash tub and the a paste form like substance is formedusing a mixyora grinder. While mixing in the mixy, a sufficient amount of bindingagent or gluing agent is used. Then the paste willbe poured into the mould of square shape (1.2ftX 1.2ft)madeofwood. After that, the paste will be pressed and levelled with thehelp of aplastic mesh.Plastic mesh is used to removeoutthe excessive water present in the paper waste. After that,the pastealongwithmoulidis dried.

After drying a hard paper cardboard like laminate sheet is formedand they are used to make objects like a carrybag to carryweightupto(7-8)kgs,PenStand,SpoonStandetc. Colors can also be added at the time of mixing paper alongwith glue agents during mixing to get a better and catchy color

(ifoptional).

3. Conclusions:

1.
Amongthesaidwastes,organicwasteisoneimportantwastewhichcanbetransformedintoaveryusefulmanure applied in Agriculture. Very effective manure was obtained at the end of the study as Certified by University of Agricultural sciences. Raichur, Karnataka, INDIA.

2. The manure composition identifiedis as below:

Nitrogen (N)–(1.32-2.01)

Phosphorus(P)-(0.03-1.98)

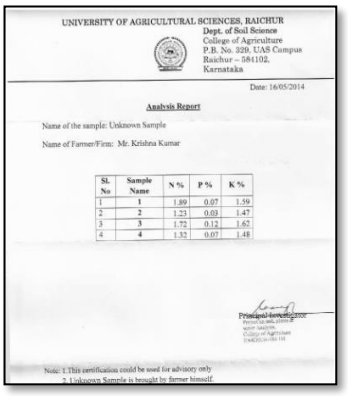
Potassium(K)-(1.18-1.62).

These values are very suitable as manure assuggestedbytheDept.ofSoilScience,UniversityofAgriculturalSciences,Raichur. Practically adoptable in the field by any Government/ Corporation and produce manure in Rural places and Develop the idea as a full-fledged Solid waste treatment unit.

4. Developed paper bags using paper, cloth and fibrous waste etc).Someofthephotosofthepaperbagsarepresentedintheimagegallery.

5.The weight that could be carried by the bags varied from 5-6 kgs. The bags which were made are of non-woven typeand they can be called as "ECO-FRIENDLY BAGS" andtheyarerecyclable.

6. Desktop itemslikepenstand, flower vase etc. can be made and the pen stand madeintheprojectisshowninthegallery.



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Karnataka

Date: 16/05/2014

Analysis Report

Name of the sample: Unknown Sample

Name of Farmer/Firm: Mr. Krishna Kumar

Sl. No	Sample Name	N %	P %	K %
1	1	1.89	0.07	1.59
2	2	1.23	0.03	1.47
3	3	1.72	0.12	1.62
4	4	1.32	0.07	1.48

Principal Investigator

Note: 1.This certification could be used for advisory only
2. Unknown Sample is brought by farmer himself.

Figure No.17: Test report on percentage of Nitrogen, Phosphorous and Potassium issued by University of Agricultural Sciences, Raichur on the stabilized organic matter.

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6. KARNATAKA, INDIA.