ANNEX–VII

SAMPLE DESIGN

1.   INTRODUCTION

The Survey of Small Manufacturing Establishments (SSME) is considered to be the complimentary of the Census of Manufacturing Establishments (CME). Since, the CME includes all manufacturing establishments engaging 10 or more persons, the scope of SSME has been restricted to the remaining such manufacturing establishments that engaged less than 10 persons. The scope of the SSME 2008/09 includes all the registered manufacturing establishments which are involved in the production process during the reference period and engaged less than 10 persons.

This note summarizes the sampling procedures employed to carry out SSME 2008/09. It comprises the construction of sampling frame, sample design, allocation and selection of samples and estimation procedure.

2.   CONSTRUCTION OF SAMPLING FRAME
2.1.   LISTING FORM

A complete enumeration of small manufacturing establishments was conducted throughout the country in 2008/09. To conduct the enumeration, a listing form was administered having following attributes:

- o Name of the Small Manufacturing Establishment

- Name of Entrepreneur
- Address
- Contact phone number
- Number of persons engaged
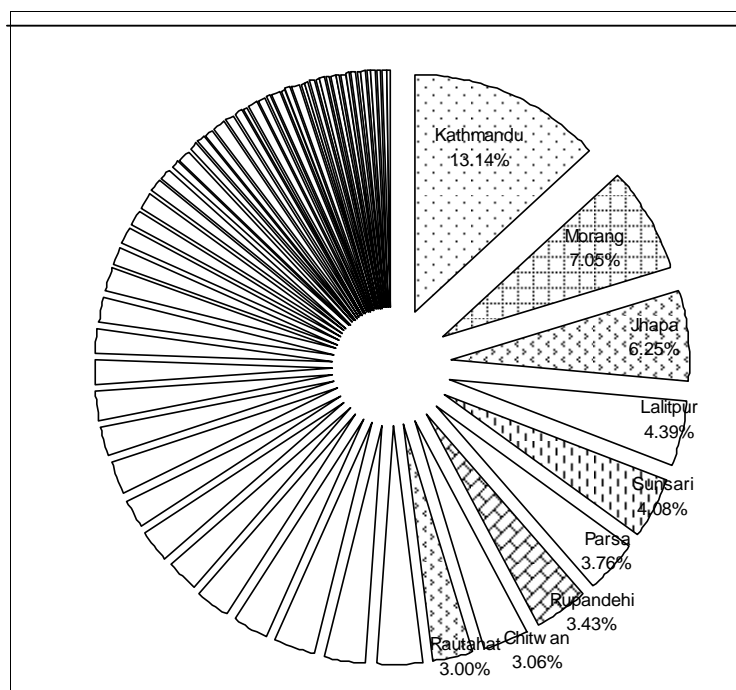- Name of Prime Product
- NSIC

The listing operation was done in "Establishment Approach". Each establishment was given a unique identification number called "Form No".

2.2.   SAMPLING FRAME

The sampling frame was constructed by type of establishments, i.e., by NSIC 4-digit level and districts. Number of manufacturing establishment was taken as a unit of the sampling frame. According to the sampling frame, altogether 32326 registered small manufacturing establishments were found at the end of the listing period. The listing period and the reference period of the survey was considered similar. The total number of establishments by districts and NSIC has been given in "ANNEX A" and "ANNEX B" respectively.

As seen in the ANNEX- A, all 75 districts have small manufacturing establishments. Kathmandu (12.47%) has the highest share in total number of establishments followed by Morang (7.05%), Jhapa (6.25%), Lalitpur (4.39%), Sunsari (4.08%) respectively. These five districts have accounted for 34.90% of total establishments.

Figure 1. : Distribution of Establishments by Districts

This could be observed at the   Figure 1. There are altogether 46 districts which belong to less than one percent of total establishments.
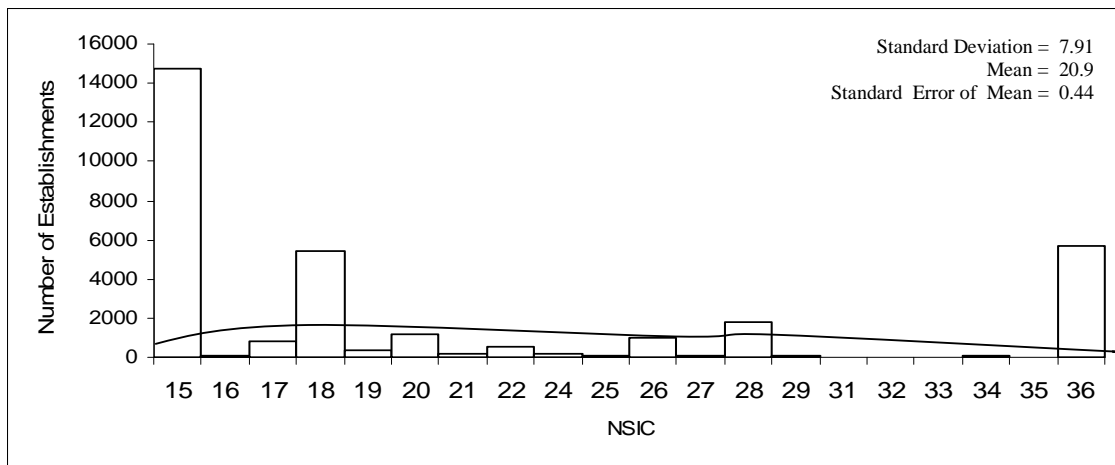
..hang (13)

can be seen at the lowest number of establishments followed by Bajhang (15), Rasuwa (17),

Bajura (21), Darchula (21), Dolpa (24) and Humla (25) respectively.

It can be said that there is very uneven distribution of establishments among districts. To obtain district level estimates, complete enumeration is seen essential in the majority of the districts.
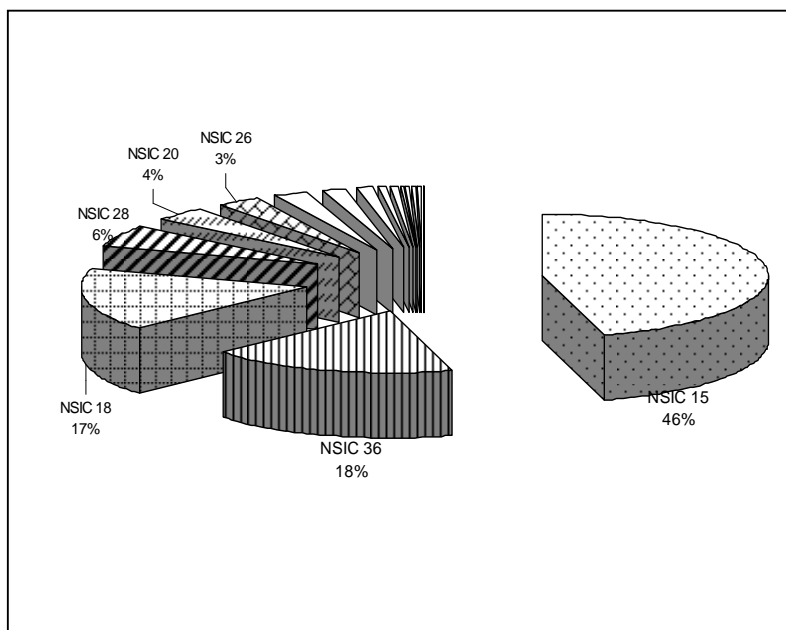
Since the objective of the survey is to obtain national and development region level estimates by NISC, it would be better to observe the characteristics of the distribution of establishments by NSIC. The Histogram with Normal Curve presented in the figure 2 has shown that NSIC does not follow Normal Distribution.

Figure 2. : Histogram of Establishments by NSIC

In terms of NSIC, at the 4-digits level, altogether 75 types of industries were enumerated. The table of ANNEX B and the figure-3 given below reveal that NSIC 1531, the manufacturing of grain mill products (38.76%) has the highest share in total number of establishments followed by NSIC 1810, the manufacturing of wearing apparel (16.71%), NSIC 3610, the manufacturing of furniture (10.28%), NSIC 3691, the manufacturing of jewellery and related articles (6.50%) and NSIC 2811, the manufacturing of structural metal products (4.59%) respectively. These five types of industries accounted for 76.83 % of total establishments.

Figure 3. : Distribution of Establishments by NSIC

There are 28 establishments under 14 different NSIC, frequency of which is less than 5 at the national level. Including them, there are 60 NSIC which

belong to less than one percent of the total establishments. They altogether has accounted for 9.51 percent of total establishments.

Since the NSIC has been organized in accordance with the homogeneous industrial activities and the objective of the survey is to produce estimates by NSIC, the distribution of such rare NSICs had been explored by development regions to find out the frequency of NSIC less than 5 within a development region. 152 such establishments were found during this assessment.

3.   SAMPLE DESIGN

The sampling design adopted in SSME 2008/09 has been significantly modified from SSME 1999/2000. The goal of the design was to select optimum number of establishments under each NSICs. So as to obtain good representation of the population, special treatment was taken to include all NSIC.

Distribution and representation of selected samples were observed and reviewed many times. The main objective of the observation and revision was to achieve national and regional representativeness of sample in NSIC at four digit and three digit level respectively. After the evaluation of the desired level of representation, a target sample of 3737 was choosen.

The sample design comprises complete enumeration as well as sample enumeration. Such establishments under any NSIC with frequency less than 5 in a development region were completely enumerated.

The sample enumeration is based on single stage stratified sampling technique following two steps as given below:—

a. Three strata, viz. "less than or equal to 5", "6-7" and "8-9" are created within NSIC by size of persons engaged;

b. Samples are selected proportionally between the strata by using SPSS software with inclusion probability,

    i.   0.10 for NSICs 1531, 1810, 2811, 3610 and 3691; and

    ii.   0.15 for remaining NSICs.

4.   ALLOCATION AND SELECTION OF SAMPLES

The Sampling Frame was sorted and splited by NSIC and development regions. A cut-off point (<5 establishments) was determined above which all establishments were choosen for complete enumeration. The number of such establishments is 152. The distribution of selected samples by the mode of selection and strata is presented in the following table including corresponding population size.

Table 1 : Distribution of Establishments and Selected Samples by Mode of Sample Selection

Mode of Selection	Number of Establishments and Samples by size of persons engaged			
	Less Than or Equal to 5	6-7 Persons	8-9 Persons	Total

	Persons							
	Population	Sample	Population	Sample	Population	Sample	Population	Sample
1. Complete Enumeration	112	112	15	15	25	25	152	152
2. Sampling Units with Selection Probability 0.10	22989	2300	1206	120	642	65	24837	2485
3. Sampling Units with Selection Probability 0.15	5615	840	899	137	823	123	7337	1100
Total	28716	3252	2120	272	1490	213	32326	3737

The remaining establishments have been divided into two groups. The first group contains all establishments within NSIC 1531, 1810, 2811, 3610 and 3691. This group has been further classified into 3 strata by number of persons engaged. There are altogether 24837 establishments within this group. Out of them, 2485 simple random samples are selected proportionally. The next group has altogether 7337 establishments, included all remaining establishments. Out of them 1100 simple random samples have been selected.

The distribution of selected samples by district and NSIC is given in the ANNEX C and ANNEX D respectively. The sampling distribution by development region is given in the following table.

Table 2: Distribution of Population and Samples by Development Regions

Development Region	Total Number of Establishments	Percent	Number of Selected Samples	Percent
Eastern Development Region	8701	26.92	992	26.55
Central Development Region	14456	44.72	1643	43.97
Western Development Region	5074	15.70	594	15.90

Mid-Western Development Region	2677	8.28	325	8.70
Far - Western Development Region	1418	4.39	183	4.90
Nepal	32326	100.00	3737	100.00

5. ESTIMATION PROCEDURE

5.1. WEIGHTING

As described above, there are not equal probabilities of selection of samples. The establishments selected for complete enumeration are given sample weight of 1, and those selected by simple random sampling were given weights equal to the inverse of their probability of selection. Hence, the weight of a sample establishment having selection probability 0.10 has become either 10 or 11 according as the proportional size of the corresponding strata. Similarly, the weight of the sample establishment having selection probability 0.15 varies from 4 to 9. Hence, using SPSS Software, the weight of each sample establishment has been obtained during the period of selection of samples. These three types of weights were merged into a consolidated sample weight file and sorted by "Form No"; the unique identification number given to each establishment. To estimate any variable under study, corresponding weight by "Form No" should be multiplied with.

5.2. ESTIMATION

Let N denotes the total number of establishments in the frame, n denotes the numbers of units in a sample, N_h denotes the number of population units in the hth stratum, n_h is the number of sample units in the hth stratum, y_h is the sample mean of the hth stratum and s_h is the sample variance of the hth stratum. Then,

Description	Formula
Total of hth stratum	$N_h * y_h$

Variance of hth stratum	$$\frac{N_h^2 S_h^2}{n_h}\left(1-\frac{n_h}{N_h}\right)$$
Total of any division	$$\sum_h N_h \overline{y_h}$$
Variance of any division	$$\sum_h \frac{N_h^2 S_h^2}{n_h}\left(1-\frac{n_h}{N_h}\right)$$

ANNEX - A

DISTRIBUTION OF ESTABLISHMENTS BY DISTRICT IN DECENDING ORDER

District Code	District Name	Number of Establishments	Percent	District Code	District Name	Number of Establishments	Percent
	Total	32326	100.00	37	Lamjung	157	0.49
27	Kathmandu	4248	13.14	52	Pyuthan	157	0.48
5	Morang	2278	7.05	14	Udayapur	153	0.47
4	Jhapa	2021	6.25	20	Sindhuli	150	0.46
25	Lalitpur	1418	4.39	8	Terhathum	129	0.40
6	Sunsari	1319	4.08	7	Dhankuta	125	0.39
34	Parsa	1214	3.76	65	Mugu	124	0.38
49	Rupandehi	1109	3.43	24	Kavrepalanchok	119	0.37
35	Chitwan	989	3.06	10	Bhojpur	119	0.37
32	Rautahat	970	3.00	53	Rolpa	114	0.35
26	Bhaktapur	936	2.89	28	Nuwakot	107	0.33
19	Sarlahi	933	2.89	2	Panchthar	101	0.31
40	Kaski	925	2.86	54	Rukum	95	0.30
48	Nawalparasi	760	2.35	50	Kapilbastu	93	0.29
18	Mahottari	756	2.34	45	Baglung	83	0.26
16	Siraha	707	2.19	12	Okhaldhunga	82	0.25
71	Kailali	688	2.13	11	Solukhumbu	80	0.25
15	Saptari	682	2.11	43	Myagdi	80	0.25
17	Dhanusha	672	2.08	21	Ramechhap	80	0.25
59	Surkhet	661	2.05	22	Dolakha	69	0.21
56	Dang	597	1.85	73	Dadeldhura	68	0.21
39	Syangja	554	1.71	51	Arghakhanchi	66	0.20
30	Dhading	546	1.69	55	Salyan	61	0.19
33	Bara	536	1.66	64	Kalikot	54	0.17
72	Kanchanpur	484	1.50	69	Achham	52	0.16
31	Makwanpur	411	1.27	42	Mustang	48	0.15

44	Parbat	344	1.06	61	Jajarkot	45	0.14
57	Banke	342	1.06	70	Doti	38	0.12
13	Khotang	340	1.05	60	Dailekh	34	0.11
3	Ilam	329	1.02	74	Baitadi	30	0.09
38	Tanahu	227	0.70	1	Taplejung	30	0.09
58	Bardiya	216	0.67	66	Humla	25	0.08
36	Gorkha	215	0.67	62	Dolpa	24	0.07
63	Jumla	207	0.64	75	Darchula	21	0.07
9	Sankhuwasabha	207	0.64	67	Bajura	21	0.06
23	Sindhupalchok	206	0.64	29	Rasuwa	17	0.05
46	Gulmi	201	0.62	68	Bajhang	15	0.05
47	Palpa	197	0.61	41	Manang	13	0.04

ANNEX B

DISTRIBUTION OF ESTABLISHMENTS BY NSIC IN DECENDING ORDER

NSIC Code	No. of Establishments	Percent	NSIC Code	No. of Establishments	Percent
Total	32326	100.00	2211	30	0.09
1531	12528	38.76	2222	29	0.09
1810	5402	16.71	2914	22	0.07
3610	3322	10.28	2911	22	0.07
3691	2100	6.50	1729	21	0.06
2811	1485	4.59	2023	18	0.06
2010	628	1.94	2102	17	0.05
1549	545	1.69	3692	17	0.05
2695	494	1.53	2021	16	0.05
2221	491	1.52	2812	14	0.04
1520	439	1.36	1554	13	0.04
2022	419	1.30	2731	12	0.04
1541	386	1.19	2519	11	0.03
2693	343	1.06	2699	11	0.03
1514	339	1.05	2692	9	0.03
1711	332	1.03	1553	7	0.02
1920	321	0.99	3599	7	0.02
3699	273	0.84	1512	7	0.02
2899	224	0.69	2109	6	0.02
1722	164	0.51	2710	6	0.02
2424	156	0.48	2610	6	0.02
1542	134	0.41	2694	5	0.02
2101	129	0.40	2422	5	0.02
2696	125	0.39	1724	5	0.02
1544	121	0.37	3694	4	0.01
2029	118	0.37	2411	3	0.01
1721	114	0.35	3140	3	0.01
2520	110	0.34	2511	3	0.01
1533	92	0.28	3190	3	0.01
1730	89	0.28	1723	2	0.01
2893	88	0.27	2421	2	0.01
2732	84	0.26	1912	2	0.01
1513	81	0.25	2930	1	0.00
1712	80	0.25	2720	1	0.00
1543	75	0.23	3120	1	0.00
3420	68	0.21	2922	1	0.00
1600	47	0.15	3210	1	0.00
2423	36	0.11	3330	1	0.00

ANNEX C

DISTRIBUTION OF SAMPLE ESTABLISHMENTS BY DISTRICTS IN DECENDING ORDER

S.N.	District Name	No. of Establishments	Percent	S.N.	District Name	No. of Establishments	P
	Total	3737	100	7	Dhankuta	18	
27	Kathmandu	475	12.71	65	Mugu	18	
5	Morang	261	6.98	8	Terhathum	17	
4	Jhapa	215	5.75	10	Bhojpur	17	
25	Lalitpur	176	4.71	14	Udayapur	17	
6	Sunsari	156	4.17	20	Sindhuli	17	
34	Parsa	142	3.8	37	Lamjung	17	
49	Rupandehi	141	3.77	52	Pyuthan	16	
35	Chitwan	117	3.13	54	Rukum	15	
26	Bhaktapur	114	3.05	24	Kavrepalanchok	13	
32	Rautahat	107	2.86	53	Rolpa	13	
40	Kaski	104	2.78	2	Panchthar	12	
19	Sarlahi	101	2.7	28	Nuwakot	11	
48	Nawalparasi	92	2.46	11	Solukhumbu	10	
71	Kailali	86	2.3	12	Okhaldhunga	10	
16	Siraha	81	2.17	50	Kapilbastu	10	
59	Surkhet	79	2.11	22	Dolakha	9	
17	Dhanusha	78	2.09	43	Myagdi	9	
18	Mahottari	78	2.09	45	Baglung	9	
15	Saptari	74	1.98	69	Achham	9	
56	Dang	71	1.9	21	Ramechhap	8	
30	Dhading	61	1.63	61	Jajarkot	8	
39	Syangja	59	1.58	73	Dadeldhura	8	
33	Bara	57	1.53	51	Arghakhanchi	7	
72	Kanchanpur	57	1.53	55	Salyan	7	
31	Makwanpur	47	1.26	75	Darchula	7	
57	Banke	40	1.07	42	Mustang	6	
3	Ilam	39	1.04	64	Kalikot	6	
13	Khotang	38	1.02	60	Dailekh	5	
44	Parbat	37	0.99	70	Doti	5	
38	Tanahu	29	0.78	66	Humla	4	
36	Gorkha	25	0.67	67	Bajura	4	
47	Palpa	25	0.67	68	Bajhang	4	
63	Jumla	25	0.67	1	Taplejung	3	
9	Sankhuwasabha	24	0.64	62	Dolpa	3	
58	Bardiya	23	0.62	74	Baitadi	3	
23	Sindhupalchok	22	0.59	29	Rasuwa	2	

| 46 | Gulmi | | 22 | 0.59 | 41 | Manang | | 2 |

ANNEX D

DISTRIBUTION OF SAMPLE ESTABLISHMENTS BY NSIC IN DECENDING ORDER

NSIC Code	No. of Establishments	Percent	NSIC Code	No. of Establishments	Percent
Total	3737	100	2211	9	0.24
1531	1254	33.56	2914	9	0.24
1810	540	14.45	2423	8	0.21
3610	332	8.88	2911	7	0.19
3691	210	5.62	3599	7	0.19
2811	149	3.99	1554	6	0.16
2010	94	2.52	2102	6	0.16
1549	82	2.19	2109	6	0.16
2221	73	1.95	3692	6	0.16
2695	73	1.95	2222	5	0.13
1520	66	1.77	2422	5	0.13
2022	65	1.74	2694	5	0.13
1541	58	1.55	2699	5	0.13
1711	54	1.45	2021	4	0.11
2693	52	1.39	2023	4	0.11
1514	51	1.36	3694	4	0.11
1920	48	1.28	1553	3	0.08
3699	44	1.18	2411	3	0.08
2899	34	0.91	2511	3	0.08
1722	24	0.64	2610	3	0.08
2029	23	0.62	2710	3	0.08
2424	23	0.62	2731	3	0.08
1542	20	0.54	3140	3	0.08
2520	20	0.54	3190	3	0.08
2696	20	0.54	1723	2	0.05
2101	19	0.51	1724	2	0.05
1544	18	0.48	1912	2	0.05
2893	18	0.48	2421	2	0.05
1721	17	0.45	2519	2	0.05
3420	15	0.4	2692	2	0.05
1513	14	0.37	2812	2	0.05
1533	14	0.37	1512	1	0.03
1543	14	0.37	2720	1	0.03
2732	14	0.37	2922	1	0.03
1730	13	0.35	2930	1	0.03
1712	12	0.32	3120	1	0.03
1600	10	0.27	3210	1	0.03

| 1729 | 9 | 0.24 | 3330 | 1 | 0.03 |