CHAPTER –III

METHODOLOGY AND PROFILE OF THE STUDY AREA
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3.1 METHODOLOGY

In this chapter it is proposed to explain how the basic data were collected, processed and used in the analysis. The required samples were chosen by adopting a stratified non-random sampling method.

To meet the objectives of the present study, primary data was collected regarding socio-economic conditions, wage payment, expenditure pattern of their family, details of other sources of income, details of debt, nature of work carried by them any previous experience, welfare measures given by employees, Details of Health care measures etc. were collected from 334 fireworks women workers in three different type of factories.

A structured schedule* consisting of questions pertaining to all the variables included in the study was used to collect the required data. A pilot study was conducted to test the validity and reliability of the schedule.

3.2 TOOLS FOR ANALYSIS

3.2.1 Chi-Square ($\chi^2$) Test

$\chi^2$ test is used to find out whether two attributes are associated or not. In the present study $\chi^2$ is applied for finding out the association between adoption of family planning and selected variables. In order to test whether or not the attributes

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*A copy of the Schedule is given in Appendix.
are associated, the null hypothesis is taken as there is no association between the two attributes studied. The formula for \( \chi^2 \) is

\[
\chi^2 = \sum \frac{(O - E)^2}{E}
\]

Where \( O \) refers to the observed frequency and \( E \) refers to the expected frequency. The expected frequency of any cell is calculated from the following equation:

\[
E = \frac{RT \times CT}{N}
\]

Where,

- \( E \) = Expected frequency
- \( RT \) = The row total for the row containing the cell.
- \( CT \) = The column total for the column containing the cell and
- \( N \) = The total number of observations.

The calculated value of \( \chi^2 \) is compared with the table value of \( \chi^2 \) for \((c-1)(r-1)\) degrees of freedom at 5 per cent level of significance. If the calculated value of \( \chi^2 \) is less than the table value of \( \chi^2 \), the hypothesis is accepted. On the other hand if the calculated value of \( \chi^2 \) is more than the table value of \( \chi^2 \), the hypothesis is rejected.

### 3.2.2 Analysis of Variance

To study the impact of the Type of work done by the sample workers and the chemicals used by them is correlated with the analysis of variance has been used. For analyzing such a relationship ‘F’ test is used. The relevant ‘F’ ratio is given as,

\[
F = \frac{\text{Estimate of Population variance based on between sample variance (} S^2 1/) }{\text{Estimate of Population variance based on between sample variance (} S^2 2/) }
\]
3.2.3 Likert Scaling Technique

A method of ascribing quantitative value to qualitative data, to make it amenable to statistical analysis. A numerical value is assigned to each potential choice and a mean figure for all the responses is computed at the end of the evaluation or survey. Used mainly in training course evaluations and market surveys, Likert scales usually have five potential choices (strongly agree, agree, neutral, disagree, strongly disagree) but sometimes go up to ten or more. The final average score represents overall level of accomplishment or attitude toward the subject matter.

Administering the Scale

Each respondent is asked to rate each item on some response scale. For instance, they could rate each item on a 1-to-5 response scale where:

1. = strongly disagree
2. = disagree
3. = undecided
4. = agree
5. = strongly agree

Along with econometric/statistical tools, conventional tools such as Percentage Analysis, Bar diagram and Pie diagram are also used.
3.4 PROFILE OF THE STUDY AREA

Virudhunagar district was carved on 15th March 1985 by trifurcation of the composite Ramanathapuram district with headquarters at Virudhunagar. The district lies between 55.00 degree and 77.00 degree of the eastern longitude and between 9.00 degree and 55.00 degree of the northern latitude. It has an area of 4243 Sq Km and is bounded on the west by Kerala State, on the north by Madurai and Sivaganga district, on the east by New Ramanathapuram district and on the south by Tirunelveli and Tuticorin districts.

3.4.1 Virudhunagar - History

Virudunagar is a small town located at a distance of 45 Kms South-West of Madurai. This place was once referred to as 'Virudupatti'. In the beginning of 20th Century A.D., Virudupatti was one among the six important places of Ramanathapuram District. Due to the rapid growth in the field of Trade and Education, it was renamed as 'Virudunagar' on 29th October 1923. The term 'virudu' means 'Award' in Tamil. The people of this community migrated to improve their business status and settled in Virudunagar during 19th century A.D. Virudunagar exports all kinds of oil to Dubai and Srilanka and also exports cotton, chilli, spices, cardamom to USA and Singapore. Virudunagar is a famous business centre without markets. The Business people of Virudunagar play an important role in price fixation of consumer products. Hence there is a popular saying, "Virudunagar produces nothing but controls everything".
3.4.2 Location & Geographical Area.

In 1985, the erstwhile Ramanathapuram District was trifurcated to create the districts of Ramanathapuram, Pasumpon Muthuramalinga Thevar Tirumagan (later renamed as Sivaganga) and Kamarajar District (later renamed as Virudhunagar District). The District headquarters is Virudhunagar town. It covers an area of 4232 sq. km. and is divided into eight taluks, namely Aruppukottai, Kariapatti, Rajapalayam, Sattur, Sivakasi, Srivilliputur, Tiruchuli and Virudhunagar. On 3rd March 1996, Sivakasi taluk was created separating the firkas of Sivakasi, Edirkottai and Salwarpatti from Sattur taluk and Mangalam firka from Virudhunagar taluk. In 31st August 1998, Kariapatti taluk was formed by separating Kariapatti, Mudukkankulam and Kalkurichi firkas from Aruppukattai taluk. Mallanginar firka, the 4th firka of the taluk was carved out of Kalkurichi firka. The District is divided into two Revenue Divisions comprising four taluks each. The Aruppukottai Revenue Division comprises Kariapatti, Tiruchuli, Aruppukottai and Virudhunagar taluks, and Sivakasi Revenue Division of Sattur, Sivakasi, Srivilliputur and Rajapalayam taluks.

According to the 2011 Census Virudhunagar district has a population of 1,943,309, roughly equal to the Nation of Lesotho or the USA state of West Virginia. This gives it a ranking of 242nd in India (out of a total of 640). The district has a population density of 454 inhabitants per square kilometre (1,180 /sq km). Its population growth rate over the decade 2001-2011 was 10.96 per cent. Virudhunagar
has a sex ratio of 1009 females for every 1000 males and a literacy rate of 80.75 per cent. It is 44.39 per cent urbanised. Majority of the population are involved in industries and agriculture. The total area of Virudhunagar District is 3445.73(sq.km).

3.4.3 Topography

The climate is generally hot and dry with a low degree of humidity. The District receives scantily rainfall. The average annual rainfall is only 987.7 mm. The frequent drought caused by the failure of the monsoon adversely affects the dry crops depending upon rain fed tanks for irrigation. Soil is predominately black soil

Temperature : Maximum 38.2 Degree Celsius.

Virudhunagar district is comprised of Archaean Charnockite, Unclassified genesis and Pleistocene Laterite.

- ARCHAEAN CHARNOCKITE rock types are available in Rajapalayam,
- Srivilliputhur, Sivakasi and Sattur Taluks.
- UNCLASSIFIED GENESIS formations are available in Sattur, Sivakasi and Aruppukottai Taluks.
- LATERITE are available in Tiruchuli, Kariapatti, Sattur and Srivilliputur Taluks.
- WESTERN GHATS are represented in Rajapalayam and Srivilliputhur Taluks and other parts of the district is plain.
- The district is drained by Arjuna river, Vaippar river, Kowsika river and Gundar.
• Major minerals of the district are Limestone and Limekankar
• Minor minerals are Multi-coloured Granite, Charnockite, Unclassified geneissic rocks, Pleistocene Laterite, Sand and Brick earth.

3.4.4 Ability of Minerals

Virudhunagar has rich mineral deposits of lime kankar and granite also. The lime and limestone deposits are concentrated in Pandalkudi, Chettipatti and Velayudhapuram villages of Arupukottai taluk and Cholapuram and Perumalpatti of Rajapalayam taluk and Gopalapuram, Kangaseval and Vertrilaiyurani of Sattur taluk. Likewise, kankar deposits are found abundant by in Kilavaraneri and P. Pudupatti in Kariapatti blocks of Arupukottai taluk. Granite deposits are also found in Thiruthangal in Sattur taluk and Pillaiyarkulam in Srivilliputhur taluk.

3.4.5 Forest

The forests are found on the eastern slopes of the Western Ghats. Only 6.3 per cent of the total geographical area of the district is under forests. Many rare and endemic varieties of flora and fauna are found along the mountain slopes. A wildlife sanctuary, spread over 480 sq. kms was established in 1989 at Shenbagathopu in Srivilliputtur taluk. The forests of Alagarkoil valley in Srivilliputur taluk and Saduragiri are known for rare medicinal plants. The medicinal value of 275 plants has been recorded and reported. The forests host a rich variety of orchids and ferns.

Virudhunagar district is known for concentration of multiple enterprises in different part of the district. Each block is unique in nature. Concentration of
industries like Match, Fireworks, Printing, Oil extraction, readymade garments, brick making, surgical cotton, textile products, cement, lime based products, rice mill, paper products, food industries, tin containers, gold jewellery making in different parts of the district offer multiple intervention for further development. It attracts the attention of the policymakers and reaches to anchor the industrial development in a balanced matter across the district. Cotton is a major commercial crop of the District and the cotton industry therefore, occupies an important place in the economy. Rajapalayam is the chief center for spinning mills and ginning factories. Surgical cotton and bandage cloth are manufactured here. Textile mills in the area produce a variety of cotton yarn and value added textile Products. The District has huge deposits of limestone and gypsum, It paves the way to establish lime based and cement industry Tamil Nadu Cements – a Public Sector undertaking at Alangulam and Madras Cements – a Private Sector undertaking at Thulukkapatti are two large cement producing units situated in this district.

Sivakasi and Sattur are known for the match industry. There are over 4500 match units concentrated in this district, giving employment to more than lakh plus people. There are nearly 450 fireworks factories giving direct employment, to about 40,000 workers and about 1 lakhs indirect such as paper tube making, Wire cutting, Box making, sale distribution in the country side. The market for fireworks is likely to grow at the rate of 10 per cent per annum. The annual output is over 50,000 tones, and turn over (at factory cost) around Rs.350 crores according to industrial sources.
Explosives for blasting are also manufactured here. Over 70 per cent of the total production of matches and fireworks in India is manufactured in Virudhunagar District. A large percentage of crackers are exported. Sivakasi is renowned the world over for its printing, Litho Presses, offset printing machines of which is the second largest number in the world, next to Guthenburg, a city in Germany. Around 450 printing presses including offset and flexo types are located in and around Sivakasi.

The printing industry was originally established to supply labels for the match and firework industries. Soon the industry developed and diversified into other areas of printing like books, posters, greeting cards and diaries. Sivakasi now offers the state of the art world class printing facilities. Sattur town was once very famous for fountain pen Nib manufacturing industries. More than 2000 families were involved in this industry. But during the recent times, usage of fountain pen has come down to larger extent and hence the industry is in declining trend. This industry, which was once the bread winning industry of the town, have almost vanished now.

Sundaram Fasteners and Brakes India Ltd., private sector enterprises of the TVS group are located at Aviyur and Kanjanaiyakampatti in Kariapatti taluk. The former manufactures high density bolts and nuts while the latter manufactures automobile brakes. There are 19335 registered small scale industrial units as on 31 December 1999 engaged in the manufacture of a very wide range of products.

Cottage and village industries are dispersed throughout the rural areas. Some common cottage industries are: making of boxes and other articles from Palmyra
leaves, metal artifacts fashioned from copper and brass, and aluminum vessel manufacture for domestic use. Gold jewelry making enterprises are concentrated in Virudhunagar, Rajapalayam, Srivilliputtur and Aruppukottai. The Traditional lock making enterprises are situated in Rajapalayam town. The district has got two revenue divisions, six municipalities, eleven blocks and seven taluks respectively. The district is endowed with a semi arid tropical climate with an average rainfall of 985.7 mm. The predominant soil type is black loamy. This type of soil is found in common in Sattur, Srivilliputtur, and Aruppukottai blocks.

Sivakasi- Mini-Japan, popularly known as mini-Japan possesses multifarious industries like Fireworks, Match Factories, Off-set litho presses which provide employment opportunities to a large mass of people in and around the city. The prouding factor and also the noteworthy feature is that people are very industrious, paying attention much to their job.

India's accident and death rates, when compared with advanced countries like US are much lower in proportion to the number of people employed, the volume and nature of work and other environmental conditions. Thanks to the Department of Explosives and its team of Officers who made this possible. Neither we nor the Department of Explosives is responsible for untoward happenings with illegally home-made fireworks. A survey conducted shows that the accident 90 per cent of India’s fireworks is produced here. The fireworks industry in Sivakasi is worth between Rs 800-1000 crore. The market for fireworks is likely to grow at the rate of
10 per cent per annum. There are nearly 450 fireworks factories giving direct employment to about 40,000 workers and about 1 lakh indirect such as paper tube making, wire cutting, box making in the country side. Fireworks in Sivakasi also produce Military Weapons training items. They are used for training in armed forces. Some airports are using Sivakasi rocket to scare away birds to avoid bird hits of aircrafts. Some of the major fireworks industries are Anil Fire Works, Arasan Fire Works, Kaleeswari Fire Works, Kuil Fire Works, Muthu Fire Works, Standard Fire Works, Ajanta Fireworks, We two Fire Works.

### 3.4.6 Match Box Industries

Sivakasi's some of the well known match industries are Amma Match Box Industry, Globe Match Box Industry, Hindu Match Box Industry, Lotus Match Box Industry, We two Match Box Industry.

### 3.4.7 Printing Industries


When Hindus just hear the very name 'Kaasi', it evokes religious sentiments with them. 'Kaasi', a place where every devout Hindu is expected to visit once in his
lifetime. Apart from that there are two other Kaasi's in Tamil Nadu - Tenkasi (meaning the Southern Kaasi) located near Courtallam, close to Kerala and Sivakasi (Kaasi of Siva) located at South of Madurai. It is interesting to note how Sivakasi came to be called so. The king, Ankesari Parakrama Pandyan ruled the southern region of Madurai, with his capital at Tenkasi. He wished to establish a Siva temple at Tenkasi and he had planned to visit Kaasi Varanasi to worship Lord Siva there and bring a Linga from there. While returning to his place with the prized Linga a few miles past Madurai, he took rest under a groove of Vilva trees. When the king woke up to continue his journey after his overnight halt, the cow that carried the Sivalinga, being brought from Varanasi, refused to move from there, for all coaxing and coercing. Moreover, the princess attained puberty that night which prohibited the carrying of the Linga. As events thus overtook auspicious time for the already proposed plan of consecrating the Linga at Tenkasi, the king reverentially placed the Linga in the place where he had halted and proceeded to Tenkasi. The place which was sanctified by the Sivalinga brought from Kaasi, henceforth came to be called Sivakasi.

3.4.8 Location

The town is located at 9.28' North latitude and 77.48' East longitude. This city is located 100.07 meter above sea level. This town consists of 81.027 hectares which works out of 31.157 per cent and 11.80 per cent to the developed and total areas respectively. The town comprises of 6.89 Sq Km in extent and population of 65,593
as per 1991 census. The total number of males are 33,123 and the number of females are 32,970.

3.4.9 HISTORY OF FIREWORKS

Fireworks originated in China some 2,000 years ago. The most prevalent legend has it that fireworks were discovered or invented by accident by a chinese cook working in a field kitchen who happened to mix charcoal, sulphur and saltpeter (all commonly found in the kitchen in those days). The mixture burned and when compressed in an enclosure (a bamboo tube), the mixture exploded. some sources say

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1 Brief Industrial Profile Virudhunagar District, Government of India, Ministry of MSME, 2012-12, pp-3-5.
that the discovery of fireworks occurred about 2,000 years ago, and other sources place the discovery sometime during the 9th century during the song dynasty (960-1279), although this could be confusion between the discovery of gunpowder by the cook and the invention of the firecracker.

A Chinese monk named Li Tian, who lived near the city of Liu Yang in Hunan Province, is credited with the invention of firecrackers about 1,000 years ago. The Chinese people celebrate the invention of the firecracker every April 18 by offering sacrifices to Li Tian. During the Song Dynasty, the local people established a temple to worship Li Tian.

The firecrackers, both then and now, are thought to have the power to fend off evil spirits and ghosts that are frightened by the loud bangs of the firecrackers. Firecrackers are used for such purposes today at most events such as births, deaths and birthdays. Chinese New Year is a particularly popular event that is celebrated with firecrackers to usher in the New Year free of the evil spirits.²

3.4.10 History of Fireworks in India

In early part of 19th century, 'bhakthapu' or bengal lights, the small mudpot, emanating bright yellow lights, became the first ever firework manufactured in India. The first fireworks factory in India was set up at calcutta by Mr.Das Gupta. Initially, he experimented with colour matches and later with gerbs, fountains and large size crackers. Subsequently, the focus of the fireworks industry shifted from Calcutta to

²http://www.fireworks.com/fireworks-university/history-fireworks
Sivakasi, thanks to the enterprising efforts of Mr. Shanmugam Nadar and Mr. Iya Nadar.

Restrictions in import during the Second World War, posed a challenge to the local industry, which took the first step in indigenizing various products. During the year 1940, the Indian Explosives Act was enforced whereby a system of licensing was introduced for manufacture, possession and sale of fireworks. This Act paved the way for organised sectors in the industry. Sivakasi, soon became a home for fireworks.

Sivakasi is the natural choice for fireworks production. Low rain fall and a dry climate prevailing in the Sivakasi area contribute to unabated production. What could have been consumed in three hours of the Diwali day came to be produced in 300 days. In Sivakasi the first fireworks industry was started in the early 20th century. Having achieved a measure of success in safety matches, colour matches and star matches, Mr. A Shanmuga Nadar and Mr. Iya Nadar ventured upon the making of sparklers –then the most popular item in the small fireworks family, which were at the time imported from the U.K. and Germany. Until the outbreak of World War II in 1939, there were only a handful of factories in Sivakasi, Trichur and Rimjalakuda in Kerala state. From 1938 to 1944 the import of fireworks and firecrackers was obstructed by War. This shortage gave a fillip to the indigenous industry, which was in its infancy.
During the year 1940, the Indian Explosives Rules were enacted whereby a system of licensing was introduced for manufacture, possession and sale. Thus came to be set up in the year 1940, the first organized factory with several precautions and safety measures. The shortage in the market helped these. Then seasonal, factories to work even during off-season and build up stocks. With World War II coming to an end and the gateway for import of raw materials having been reopened, the indigenous industry enlarged itself not only the existing factories broadened their efforts, there came into existence several new units, of which National Fireworks, Kaliswari Fireworks and Standard Fireworks were prominent in the year 1942. These three factories started marketing their products throughout the length and breadth of India. These were later supplemented by new units at the average of 10 per year. What started as 1 or 2 factories in 1923 rose to 3 in 1942, and by the year 1980 the number of factories had risen to 189. By the end of 2010 the total number of factories was 689 in Sivakasi alone\(^3\).

\(^3\)http://www.standardfireworks.in/profile.html
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