

Best Practice in Small-scale Gemstone Mining

DFID Knowledge and Research Project

DRAFT

**A SOCIO-ECONOMIC STUDY OF
SMALL-SCALE GEMSTONE MINING
IN SRI LANKA**



1999

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This project is an output from a project (R7115) funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of the DFID.

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A SOCIO-ECONOMIC STUDY OF SMALL-SCALE GEMSTONE MINING IN SRI LANKA

Executive Summary

Gemstone mining in the study area was carried out on a small-scale basis using manual labour and traditional technology. The organisation of the industry is based on a co-operative system and production sharing.

A decline in the available area of gemstone deposits, a decline in the income generated, an increase in the cost of inputs, a shortage of capital, and difficulties in obtaining licences were some of the problems encountered by small-scale mine owners. No sufficient measures have been taken by the National Gem and Jewellery Authority to overcome these problems.

Mine owners were interested to undergo training on how to explore for gemstone deposits, how to determine the correct value of gemstones, small business management and repair and maintenance of equipment.

The majority of the mineworkers belonged to low income families and had very poor living conditions. The lack of a regular income, shortage of gemstone deposits and the decline in the price obtained, exploitation by mine owners, hazardous operation in mines, and the lack of pension and insurance coverage during their old age were some of the problems encountered by mine workers.

Mine workers expressed most interest in participating in training on how to determine the correct value of gemstones, how to apply first aid, how to explore for gemstone deposits, and mining laws and labour regulations.

Both the mine owners and mine workers preferred a classroom style of training delivery on a non-work day. However, mine workers also felt that on-the-job training methods would be valuable to them.

1. Introduction

Gem deposits are dispersed over a large part of Sri Lanka, however, the Ratnapura district of the Sabaragamuwa province is the most renowned and Ratnapura is known as the city of gems, due to its high concentration of gem mineral deposits. Among the mineral resources mined in Sri Lanka gemstones have a special position because of their global scarcity and their high value.

The economic activities sustained by the gem industry include:

- Gemstone mining
- Gemstone trading
- Geuda treatment
- Lapidary
- Jewellery making

Thus the gemstone industry contributes a considerable amount to domestic and foreign income. Table 1 indicates the foreign income earned from gemstones between 1989 and 1993.

Table 1: Foreign Income earned from Gem Exports (1989-1993)

Year	Million Rupees	US \$
1989	2,204	40,073
1990	2,933	53,327
1991	2,358	42,873
1992	2,482	45,127
1993	3,402	61,855

Source: Export Development Board, 1995

NB: Exchange rate Rs55 = US \$1

The Sri Lankan Government established the State Gem Corporation in 1971. The main purpose of the corporation is to provide systematic improvement to the Sri Lankan gem industry by helping to improve skills and craftsmanship, increasing gem exports, allocating state-owned land for gem mining, and issuing permits and licences. With the broadening of these objectives the Corporation has subsequently been restructured and renamed as the National Gem and Jewellery Authority.

Mining for gems is carried out largely at a small-scale co-operative basis using traditional technology. A number of miners form a group and share the costs, labour and profits from the sale of any gemstones found. Such a group is known as *karuhaula*. The bearer of the license for such a mine is known as the owner of the mine. He joins the group with the licence *haul* or share. Each worker in a mine holds a share by contributing his labour. The others involved in *karuhaula* include the owner of the land, the owner of the water pump, and the supplier of timber and logs for lining the pit.

Miners are paid a weekly allowance, however they are entitled to a percentage of any profit received from the mine. All the others in *karuhaula* also receive their share by percentages calculated on the total gross realisation.

A process of rituals and offerings to the spirit in charge of the wealth hidden underneath the earth follows the opening of a new mine. An auspicious date and time is decreed to be the date when work can commence. The work takes place in a ritualistic manner due to the distressful and risky nature of operating in the mines. Women are therefore not engaged in any activity of the mine due to the belief that they are impure.

Miners serve in a mine under the guidance of the owner. The miners work to excavate a pit, collect gravel, and wash and examine the gravel in the search for gems. Gem mines generally fall into two categories namely, **Pit mines** and **River workings**. In areas where gem deposits are located near the surface shallow circular pits are dug – Ground pits. The depth of a shallow pit can be only a few metres. **Deep mine Pits** are rectangular in shape and may have a depth of well over 50 metres. In deep mines gem deposits are also excavated horizontally creating tunnels to extend from 6 to 9 metres or occasionally even more away from the shaft.

In **river workings** miners use mamoties with handles about 10 metres long (a kind of rake-like tool used to scrap sediments) to stir up and collect sediments from the riverbed. Mining is usually carried out after the rainy season. In river working miners build a dam across the river to collect the sediment. Among the river workers there are competent divers who are occasionally needed to remove the disturbances in the riverbed such as logs and rocks. The time spent river working seems to be less per year than for the ground pits.

1.1 Objectives of the study

The aim of this study on small-scale gem mining in Sri Lanka was to:

- 1) To develop a profile on gemstone mine owners and mine workers.
- 2) To assess the needs and priorities of the mine owners and mine workers.
- 3) To identify future preferred areas of training and methods of information sharing.

1.2 Research Methodology

This study was carried out in three divisional secretariat areas namely Kuruwita, Opanayake and Pelmadulla (Pelmadulla was selected instead of Gadakawela because it is an area where gem mines are highly concentrated in the district). The sample of this study consisted of 12 mine owners and 30 mine workers selected from three village units of these respective areas: Kosgala village in Kuruwita, Kattanga in Opanayake and Ganaegama in Pelmadulla in which gem mining is highly concentrated. Whilst it is acknowledged that these samples are small ten mineworkers (in three villages = 30) and four mine owners (in three villages = 12) the findings are considered representative of the general situation found in gemstone mining in Sri Lanka.

In the selection of mine owners and mine workers an attempt was made to draw them from different types of mines i.e. Deep mines, shallow mines and river workings. The necessary information was collected from these respondents using a structured questionnaire. In addition individual and group discussions were conducted with mine owners and mine workers in these villages and with officers of the National Gem and Jewellery Authority in Colombo. During this study additional information was collected through observation of the mining processes of different type of mines in the study area. Secondary information on the gem mining industry in Sri Lanka was also collected.

2. Profile of Gem Mine Owners in Sri Lanka

2.1 The Socio-economic Context of Mine Owners

Gem mining is an industry limited entirely to men and all the mine owners in the sample were found to be male. Organisation and operation of a mine required special skills and a long experience of the industry. The majority of mine owners in the sample have been involved in gem mining for a long period of time and are now at least middle-aged, as shown in Table 2.

Table 2: Age Structure of Mine Owners

Age level	No. of people	Percentage (%)
18 - 40	04	33
41 - 50	06	50
>50	02	17
Total	12	100

According to the above information it was revealed that 67 percent of mine owners were over 41 years old and many of them i.e. 50% fell into the age category of 41-50 years. Furthermore, except for one person all the others were married. Another specific characteristic among the mine owners was that they had a fairly satisfactory level of education. Table 3 indicates the level of education among them.

Table 3: Level of Education among Mine Owners

Level of education	No. of people	Percentage (%)
Below grade 8	02	17
G.C.E. O' Level	06	50
G.C.E. A' Level	03	25
Graduate	01	08
Total	12	100

83 % of mine owners possessed an education of G.C.E. O' level or above. The majority i.e. 50 percent had studied up to G.C.E. O' level. Existence of this level of education will most likely have contributed to their reaching the position of mine owner due to their improved management skills. Research also revealed that many mine

owners seemed to be interested in maintaining smaller families - this may also be a result of their level of education. Table 4 indicates the family size of mine owners in the sample.

Table 4: Family Size of Mine Owners

Number of Family Members	Number of Households	PERCENTAGE (%)
< 4	07	58
5 - 6	05	42
Total	12	100

The above information revealed that 58% of the families in the sample consisted of four members or less. The other families' membership varied from five to six members. Existence of smaller families is one of the factors helping to limit the family expenditure, which invariably increases the capacity for investment in the industry. This situation is further clear by the fact that in 50 percent of the families, number of dependants were two people while it was three to four among the rest.

With regard to the involvement of mine owners in economic generation, it was revealed that all of them were engaged in several economic activities. The existing relationship between mining and other economic activities is visible in several aspects. Firstly, some mine owners had invested their income in economic generations such as tea and rubber plantations or other enterprises. On occasions where they received a large sum of money from selling a gem, many of them invested some of it in another economic venture. Their level of education supported this situation. However, it was also reported that some people had destroyed their economic stability by unproductively spending their income on a luxurious type of living.

Secondly, a sound economic position is required for a mine owner to continually invest in mines because sometimes they are without any income for several months. It is therefore possible for a mine owner to lose his investments being unable to receive an income enough to at least to cover his expenses. Therefore, the engagement and continuity of involvement in mining is more feasible for those who possess other avenues of income. For instance, Mr. M.D. Dhanapala, a retired schoolteacher in Kuruwita, had invested in mining since he was teaching. He invested the income he

received from mining in a tea plantation. Presently he possesses a tea plantation of twenty acres and a tea plant nursery. Income generated from these economic enterprises has been invested into six mines. Mining was the principle economic activity for only four people (33%) of those interviewed. Table 5 indicates the principle economic activities of the mine owners.

Table 5: Main Economic Activities of Mine Owners

Economic activity	Number of Mine Owners	Percentage (%)
Mining	04	33
Gem buying	03	25
Tea Plantation	01	08
Commercial enterprises	04	34
Total	12	100

According to the above information, the majority of mine owners (67%) are involved in various other activities such as buying gems, tea plantation and commercial enterprises. Mining for gems, therefore, is not necessarily their main economic. Indeed, some mine owners were found to be leading a luxurious life depending on their income and other conditions. They possess large and modern housing, expensive cars and follow a conspicuous consumption pattern that shows their social status.

2.2 Operations of Mine Owners

Many mine owners were usually found operating more than one mine. Only two people in the sample were found to be involved in only a single mine. Table 6 shows the number of mines operated by the mine owners in the sample.

Table 6: Number of Mines operated by Mine Owners

Number of mines	Number of Mine Owners	Percentage (%)
1- 3	7	58
4 - 6	2	17
> 7	3	25
Total	12	100

The majority of mine owners (58%) are involved in either three or less mines, however there were some people (25% of those interviewed) who had the capacity to operate more than seven mines. Involvement in several mines is basically dependent on one's capacity of bearing the necessary expenditure. The three individuals who were involved in more than seven mines were the gem buyers who had a sound economic position. The main reason for them to be involved in several mines was to reduce the risk in mining. When a person has several mines, the possibility for him to discover gemstones is higher than when operating a single mine. On occasions where there are no gems available in one mine the loss could be minimised or covered by the gems obtained from another mine.

There were three categories of mines available in the study area namely, shallow mines, deep mines and river workings. Some people in the sample were involved in all these categories of mines. Table 7 shows the number of mine owners engaged in these different categories.

Table 7: Type of Mines and Mine Owners

	Shallow mines	Deep mines	River workings
Number of mines	14	38	3
Number of owners	5	10	3
Illicit mines	2	5	3

Table 7 shows that the majority of mine owners are involved in deep mines - such mines are the most visible in the study area. Shallow mines were visible in places where gem deposits happened to be located close to the surface of the earth. Scarcity of certain deposits compels miners to excavate deep mines. There are fewer mine

owners involved in river working because usually gem deposits likely to be there have been already exploited by continued operations for a long time.

It was also found that some mines were operating without legal permission. Some mine owners while carrying out a few licensed mines also maintained illicit mines. River working is permitted only at sites where the Authority has leased to the public for mining. Since there had been no such leases recently some individuals had taken to illicit mining.

The number of mineworkers employed in mines may vary in different categories of mines. In shallow mines 5-6 people were generally employed while it is usually 8-12 miners in deep mines. Among river workers it was usually around seven people. Furthermore, the number of mine workers employed under a mine owner also varied according to the number of mines owned by each person. Table 8 indicates the number of miners employed by the mine owners.

Table 8: Number of Miners Employed by Mine Owners

Number of miners employed	No. of mine owners
< 10	1
11 - 16	6
17 - 40	2
> 40	3
Total	12

According to the above information there are seven mine owners (58 percent) who employed less than 16 mine workers. Furthermore there are another five mine owners who employ more than 16 people.

Gem mining has been carried out for a long period of time in the Ratnapura district. Some of the mine owners in the sample have been involved in the industry for many years. Table 9 indicates the period of time mine owners have been involved in the industry.

Table 9: Time Involved in the Gem Mining Industry

Time period (Years)	Number of mine owners
< 5	03
06 - 10	02
11 - 20	03
21 - 30	03
> 31	01
Total	12

It is evident by the above information that among the mine owners seven people (58%) have been involved in the industry for more than ten years. Another 33% have had experience for more than twenty years. Engagement in mining over such a long period of time can be considered as a factor that led them to gain a sound knowledge of the industry.

This study investigated the main factors that motivated mine owners to get involved in the industry – eight people in the sample (67%) cited the profitability as the main reason. Another three people cited the previous experience they had in the industry, whilst for the other person lack of availability of other economic options compelled him to get involved in mining. Another important point was that eight of the mine owners entered the industry firstly as mineworkers. The experience and the income they earned through that employment enabled them to mobilise as mine owners.

2.3 Organisation in Mine Operations

2.3.1 Legislation

The mine owner, being the head of a mine, is responsible for the organisation of various activities and requirements. Firstly, he is responsible for the selection of a plot of land for the proposed mine and receiving the legal sanction. If the land is solely owned by the mine owner he can apply for a license with land titles. On occasions where several people own the land a legal document must be produced with their consent to grant the land for mining. The regional office of the National Gem and Jewellery Authority in Ratnapura issues permits for gem mines in Ratnapura district. A permit is costs Rs. 1000 (US \$18) and a refundable deposit of Rs.4000 (US \$72) is also charged. For each additional mine proposed to be carried out in the particular land, Rs. 1000 (US \$18) is charged. When a mine is proposed in agricultural low land

it is necessary to apply for a permit from the Commissioner of Agrarian Service Department prior to approaching the Gem and Jewellery Authority. The permit costs Rs. 350 (US \$6) and a refundable deposit of Rs. 1000 (US \$18) is also charged.

2.3.2 Ownership of the Mine

Among the mine owners 11 were involved with ground mines and two of them were with river mines as well. The ownership of mine lands is shown in table 10.

Table 10: The Ownership of Mine Lands

Ownership	Number
Personally owned	3
Co-ownership	8
Total	11

Table 10 shows that the majority of mine owners were carrying out mining on land with co-ownership. Existence of undivided lands is a common phenomenon in the district mainly due to the extreme value of it due to the gem deposits. It was reported that gaining the consent of each owner of an area of land for mining is one of the most difficult tasks to be faced by a person searching for a site.

2.3.3 Investments for Mine Owners

When the legal requirements are fulfilled a mine owner is required to organise a team to supply labour. They are paid a weekly allowance of Rs. 60-100 (US \$1-2) for their contribution. The allowance paid to workers was found to varying across the three areas of the study. The mine owner provides the expenditure for meals and tea at work. On occasions of any accidents and distresses provision of necessary assistance is also the responsibility of mine owners.

Other than the labour, installation of water pumps to remove the water accumulated in the pit and provision of wood and planks to support the walls of deep mines are other basic requirements to be supplied. The investments for mines are generally provided by the other income-generating activities of the owners. It was reported that on some occasions they were compelled either to mortgage or sell their properties in order to finance operations. Mine owners sometimes involved other people to help support some of these investments such as finance for the weekly allowance for workers, provision of water pumps, or the supply of wood and planks. There were four people

who had local partners to support some of these investments. Mine owners stated that they have no access to bank loans due to the risky and unpredictable nature of their operations.

2.3.4 Typical Balance of Payments for a Mine

As the activities of a mine are organised on a co-operative basis the payments for such investments are made on the gross realisation of a mine. Firstly, one tenth of the value of the income is spent on the water pump. Secondly, from the balance another one fifth is paid for the share of the land. When there are several owners of a plot of land the amount is divided according to the extent of share of each person. Thirdly, one tenth of the balance is paid for the owner, or the holder of the license. From the balance all the expenditure hitherto invested for the mine such as expenditure for food for workers, fuel for the pump, logs and planks, and other equipment is deducted. Finally, the balance amount is divided into two sections and one is divided equally among the mineworkers. The remaining is granted to the person who invested the money for the weekly allowances for the workers.

2.4 Value of Gem Production

This study investigated the gross value of gem production among mine owners during last five years. Five people in the sample were not willing to disclose their turnover. Table 11 indicates the value of gem production among the other seven people (it was not possible to verify these figures).

Table 11: Gross Production Value of Gems from 1994-1998

Year	Total value (Rs.100,000)	Average production of a producer Rs.100,000)	Lowest value of production (Rs.100,000)	Highest value of the production (Rs.100,000)
1994	83.0 (US \$ 150,909)	11.0 (US \$2,000)	1.0 (US \$1,818)	50.0 (US \$90,909)
1995	62.0 (US \$112,727)	8.9 (US \$16,182)	1.0 (US \$1,818)	35.0 (US \$63,636)
1996	165.4 (US \$300,727)	23.6 (US \$42,909)	0.3 (US \$545)	138.0 (US \$250,909)
1997	15.7 (US \$28,545)	2.2 (US \$4,000)	0.3 (US \$545)	4.5 (US \$8,182)
1998	10.0 (US \$18,182)	1.7 (US \$3,091/0	0.4 (US \$727)	3.0 (US \$5,455)

Mine owners find different varieties of gems each year and they were thus unable to express the exact volume of this production. Other than the production in 1996, the annual value of production seems to have declined quite considerably since 1994. The high production value in 1996 is an anomaly due to the discovery of gemstones valued at Rs.13,800,000 (US \$250,909) by one mine in the sample. According to the respondents the increasing shortage of gem deposits and the decline in gem values have been main reasons for this situation. The arrival of international gem buyers, especially from Thailand and Japan, has also declined during the recent past creating further low demand for gems.

All the varieties of gem minerals are available in the Ratnapura district. However, sapphire, topaz, ruby, cats eye and geuda are the varieties frequently available in the Kuruwita, Pelmadulla and Opanayaka areas.

2.5 Problems encountered by Mine Owners

Research identified several problems presently encountered by mine owners. They mainly fall into two categories – problems associated with production, and problems associated with marketing.

2.5.1 Problems associated with Production

The continuous presence of mine operations over a long period of time in these areas has caused a shortage of gem deposits. Gem mining has therefore become a more risky operation for investors. As one mine owner in Pelmadulla explained even though he had invested more than Rs. 100,000 (US \$1,818) in his mine he could only recover Rs. 30,000 (US \$545) from its gems.

The increasing cost of raw materials is also a problem encountered by small-scale mine owners. For instance, the cost of a truck load of rubber logs which is used for framing the walls of a mine was Rs. 2500 (US \$45) in 1990. This has now risen to over Rs. 9500 (US \$173). This has meant that the cost for the logs and planks required to be invested in a deep mine has risen to almost Rs.70,000 (US \$1,273). Furthermore, a large sum of money has to be invested in water pumps, fuel and for allowances to workers and food.

Apart from the high cost for raw materials, many mine owners were of the view that the relevant institutions issuing licenses also charge exorbitant rates. For instance if the proposed mine is located in the vicinity of houses or accessible roads the deposit could be as much as Rs.25,000 (US \$455). Any damages to such properties will be recovered from the deposit. In the case of agricultural low lands an additional permit is required from the Department of Agrarian Service. The interference of two institutions in issuing licences and lack of co-ordination between them has resulted in inconveniences for mine owners.

Certain policies of the National Gem and Jewellery Authority have also created problems for mine owners. One of the functions of the Authority is to conduct gem land auctions to grant government lands for mining. As many respondents pointed out, at such auctions the Authority used to distribute only a handful of sites enabling only the wealthy mine owners to purchase them at high rates. Furthermore, the government has granted many public lands of this area to the private sector for tea and rubber plantations. Mine owners were of the view that the Authority must interfere to grant some of these lands for mine operations so as to encourage the continuity of the industry.

The Insurance Scheme for mineworkers, which was introduced by the National Gem and Jewellery Authority, has granted legal recognition for them. However, the registering of workers at the Authority and the deposit of Rs.120 (US \$2) required for

each person has increased the cost of mine owners in receiving legal sanction. Traditionally a mine owner had the right to dismiss any worker found to be disloyal to him or for stealing gems. As the mine owners pointed out, such rights have been limited by the registration of mine workers.

The existence of undivided lands in these areas is another difficulty that the mine owners have to face in receiving licences. Among the respondents in the sample 8 people were carrying out mines on undivided lands. As one person pointed out there are 70 owners of the land in which he is carrying out the mining. Obtaining the consent of two thirds of the owners is a requirement of the Authority prior to the award of a licence. As some owners are not living in the vicinity, gaining the consent of such people has been a difficult task for them. On occasions where any shareholder disagrees with the mine owner legal actions could be taken to suspend operations.

The increasing cost of inputs and the decline in production has resulted in a stressful situation for mine owners. This situation has greatly reduced their capability to re-invest in new mines. Mining is not an interesting area for commercial banks and they are reluctant to grant loans for such a risky type of investment. Therefore shortage of capital to invest in the industry is also a problem encountered by some mine owners.

2.5.2 Problems associated with Marketing

Mine owners were found to be encountering several problems in marketing too. A competitive and higher price was available for gems when foreign buyers were involved in the gem trade. Their absence in the area for several years has resulted in a drop in the market price of gems. The government has reduced the minimum amount of remittance a foreign purchaser should make from US \$10,000 to US \$5,000 in an attempt to encourage their involvement. However, there has been no significant improvement through such efforts to date. According to some local buyers factors such as the decline of gem production in Sri Lanka, and the availability of gems at relatively low prices in other countries has contributed to this situation.

The popular method of selling gems collected from a mine is through public auctions. This is mainly to receive a competitive price. However it was reported that local buyers frequently used to organise themselves to bid for a low price and then sell for a higher price and share the profit among them. On occasions where a person approached a buyer privately to sell gemstones the buyer usually bids at a low rate and communicates to of his colleagues the price he offered to prevent them from bidding at

a higher rate. This unity and collaboration amongst gem buyers is a factor that has helped to keep the price of gems artificially low.

A summary of the aforementioned problems encountered by mine owners is shown below:

Problems in production:

- 1) Increasing price of raw materials
- 2) High licensing fee rates
- 3) Interference from Licensing institutions
- 4) Lack of co-ordination between institutions resulting in delays etc
- 5) The Government's policies on auctions
- 6) The rise in the costs of gaining legal sanction due to the need to register each worker (Insurance Scheme which provides legal recognition)
- 7) Registration and formalisation of mine workers has meant that some owners' rights to dismiss workers and protect against theft have been curtailed
- 8) The need to gain two thirds consent from owners of undivided land and meant delays and greater potential for legal action
- 9) A shortage of capital to make initial investments.

Problems in marketing:

- 1) Absence of foreign gem buyers has resulted in lower prices being offered
- 2) Greater competition from other Gemstone countries
- 3) The organised low bidding of buyers (below market value)

2.6 Potential Solutions to Problems as Proposed by Mine Owners

Mine owners gave the following suggestions as to how to overcome some of the difficulties they face:

- 1) The National Gem and Jewellery Authority could make more government land available for mining.
- 2) The National Gem and Jewellery Authority could be encouraged to:
 - a) Reduce the rates for permits and the amount of deposits required
 - b) Reduce the rates paid for insuring workers

- c) Build up greater co-ordination between the Authority and the Agrarian Service Department to facilitate the issuing of permits.
- 3) The Government should encourage foreign buyers to get involved in the Sri Lankan gem trade again.
- 4) The introduction of a credit scheme for small-scale mine owners at low rates.
- 5) The introduction of an insurance scheme to provide support during loss periods.

3. Profile of Gem mine workers in Sri Lanka

3.1 The Socio-economic Context of Mine Workers

The hard and laborious work required in gemstone mines has confined mining entirely to men in Sri Lanka. Through the information collected from a sample of thirty mineworkers during this study certain specific socio-economic characteristics could be identified. Research revealed that the majority (70%) of gem mine workers in the sample fall into the 18-50 years age category as shown in Table 12.

Table 12: Age Distribution of Mine Workers

Age level	No. of workers	Percentage (%)
18-35	11	37
36-50	10	33
> 51	9	30
Total	30	100

The employment of young children and elderly people is naturally limited due to the hard labour required in this industry. The prohibition of employing children below 18 years by the National Gem and Jewellery Authority has also supported this situation. However, in the case of any emergency to a miner providing employment to a grown-up child in the family to substitute his labour has been a common phenomenon.

Many mineworkers joined the industry at a young age. 23 people in the sample (77%) were married. A common view of many respondents was that the lure of mining had encouraged them to drop out of school at an early age. Table 13 indicates the level of education among them:

Table 13: Level of education among Mine Workers

Level of education	Number of people	Percentage (%)
> 5 grade	8	27
6 – 8 grade	15	50
GCE O’level	4	13
GCE A’level	2	7
Never been to school	1	3
Total	30	100

Among the mineworkers seventy percent in the sample received an education above primary level. However, the majority of them i.e. 50 percent fall into the education level of 6-8 grades. Even though the level of education is lower than the mine owners many of the mineworkers seemed to be literate.

Many of the mineworkers share low living conditions. Poverty and a low level of income are the contributory factors. It was further unveiled that 80% of mineworkers were recipients of Samurdhi – poverty alleviation benefits from the government. These benefits are given to the most vulnerable of families on a sliding scale however the amounts are very low (Rs 200-1,000 [Us \$3.6-18 per month]) and not enough to live from on their own. The occurrence of large families and a higher number of dependants are also salient characteristics among them. Tables 14 and 15 show the family size and number of dependants in those families.

Table 14: Family size of Mine Workers

Number of family members	Number of Mine Workers	Percentage (%)
< 4	08	27
5 - 6	14	47
>7	08	26
Total	30	100

Table 15: Number of Dependants in Mine Workers' Families

NUMBER OF DEPENDANTS	Number of Mine Workers' Families	Percentage (%)
< 2	09	30
3 - 4	16	53
> 5	05	17
Total	30	100

According to the above tables 73% of mine workers' families consisted of five or more members. Similarly in 70% of families had three or more dependants. Apart from the existence of large families the lack of viable alternative economic resources for their maintenance appeared to be a key factor contributing to their poor living conditions. Table 16 indicates the extent of land ownership of these families.

Table 16: Extent of Land Ownership

Extent of land (acres)	High land		Low land	
	Number of families	Percentage (%)	Number of families	Percentage (%)
No land	7	23	19	63
< 0.25	12	40	2	7
< 0.5	3	10	3	10
< 1	5	17	2	7
> 1	3	10	4	13
Total	30	100	30	100

NB: High land refers to higher altitude areas where the common agriculture is fruit and grains; Low land refers to lower lying areas where the crop system is mainly paddy fields.

The information in Table 16 reveals that 23% of mineworker families had no high land and 63% had no low land. Moreover, among the high land owners 67% of families owned an extent of less than one acre. This proportion is 24% among low landholders. Apart from the ownership of smallholding, the other characteristic visible was that

several owners shared much of these lands. For instance, 57% of high landowners and 55% of low landowners had co-ownership for their entitlements. Therefore, mineworkers have largely been alienated from the agricultural economy and compelled to seek non-agricultural means of earning a livelihood.

The research also investigated the work experience and qualifications the miners possessed other than mining-related, as indicated in Table 17.

Table 17: Other Work Experience or Qualifications of Mine Workers

Work experience	Number of People	Percentage (%)
Petty trade	3	10
Skilled jobs	6	20
Animal husbandry	2	7
Agriculture	14	47
No other skill	5	16

84% of mineworkers had work experience in different economic activities, the majority (47 percent) had experience in agriculture whilst others had some non-agricultural experience such as petty trading, skilled jobs and animal husbandry. Among the mine workers 80% were dependent on mining as their main source of income. However, due to the irregularity of income from mining some of them have also engaged in other economic activities. Table 18 shows the other economic activities they were involved in.

Table 18: Other Economic Activities of some Mine Workers

Economic activity	Number of workers	Percentage (%)
Agriculture	12	40
Skilled work	2	7
Unskilled work	2	7
Not involved	14	46
Total	30	100

54% of the mineworkers in the sample were involved in other economic activities such as agriculture, skilled and unskilled work. Among those who were involved in

agriculture, five people had tea plantations and four people had rubber plantations in smallholdings. Others were involved in paddy cultivation. Mine workers who had access to skilled and unskilled work said they involve themselves in such activities whenever they have no work in the mines.

The monthly income mineworkers receive from other sources such as Samurdhi benefits, weekly allowance received from mines, and other economic activities is shown in Table 19:

Table 19: Monthly Income of Mine Workers

Level of income (Rs. and US \$)	Number of people	Percentage (%)
< 1,500 (<US \$27)	11	37
1,501 – 3,000 (US \$27-54)	15	53
3,001 - 6,000 (US \$55-109)	2	7
> 6,001 (>US \$110)	1	3
Total	30	100

Table 19 shows that 37% of mine workers were receiving an income of less than Rs. 1,500 (US \$27) while 87% received less than Rs. 3,000 (US \$54). The mine workers who had smallholding tea plantations showed slightly better incomes than the others due to the satisfactory price for tea. However, many of them were of the view that they had no access to a sufficient and regular income for living. Such conditions have increased the indebtedness among these workers. Many described how they used to receive their daily provisions on credit from retail shopkeepers on the agreement to settle later after the realisation of gems – if they have not found gems their debts thus keep rising.

3.2 Employment Information of Mine Workers

A mineworker joins to serve a mine owner on a verbal agreement. He becomes a shareholder who invests his labour in the mine business and who also shares the risk with the mine owner. In return he receives a certain share of the income derived by the mine in which he serves. The people who are considered faithful and efficient are selected as mine workers. Attention is paid to trustworthiness in order to avoid gem stealing. As such almost every mineworker is well known to the mine owner and is a

person from the same area. During the study, the following reasons were observed as to why the mineworkers engage themselves in gem mining (see Table 20).

Table 20: Reasons to become involved in Gem Mining

Reason	Number of people	Percentage (%)
Absence of alternative employment	14	47
Possession of relevant knowledge	7	23
Profitability	6	20
Other	3	10
Total	30	100

Table 20 reveals that most of the mine workers in the sample (47 percent) have been engaged in gem mining due to the lack of availability of other employment opportunities in the region. The fact that gem mining is a traditional industry in these areas has also contributed to people's involvement. Another 23% felt that the knowledge gained since their childhood by observing this industry encourage them to get involved. Only 20% mentioned that they joined this industry considering its profitability. Accordingly, it appeared that many joined this traditional industry as they could serve it while living in the same area. Table 21 shows how long the mineworkers have been involved in the industry.

Table 21: Length of Employment in Mining

PERIOD (YEARS)	Number of Miners	Percentage (%)
< 5	4	13
6 - 10	3	10
11 - 20	11	37
21 - 30	6	20
> 31	6	20
Total	30	100

According to these details it is clear that 77% of the mineworkers have been engaged in this industry for more than 10 years. Most of the mineworkers have such long-

standing service they have therefore built up detailed and established experience of the field.

The period of service commitment required in mines depend on the type of mine. Deep mines may require a long period whereas river workings and shallow mines may require comparatively shorter periods. A deep mine generally requires the service for six months or more whilst it may be only a few weeks with regard to shallow mines or river workings. Once a worker is allocated to a particular mine his employment opportunities would only increase if the interest mine owner decided to start another mine. All the people interviewed indicated that they had received no opportunity to work in mines throughout the year of research (1999). Table 22 revealed that there is considerable under-employment among them.

Table 22: Approximate Time Worked per Year by Miners

Period (Months)	Number of Miners	Percentage (%)
4 - 6	6	20
7 - 9	16	53
> 10	8	27
Total	30	100

Several reasons could be observed for the under-employment of mine workers:

- Limitation to continuous operation of a mine by the owner
- Need by the owner of capital to start a second mine on completion of one mine
- Location of suitable land
- Requirement of legal permission which takes considerable time
- The requirement that, prior to embarking on another mine, investors of the first mine are paid their due shares out of its income.
- At times buyers do not give ready cash for their purchases thus compelling the mine owner to wait to settle dues to shareholders.
- The heavy rains experienced in the Ratnapura district during the months of April, May and June followed by floods is another drawback for mine operations.

Every mine has two leading mine workers nominated because they are efficient people and they possess a wide knowledge of mining. It is their duty to allocate work tasks to the miners and to advise them. Mine workers are paid a weekly allowance for their

labour. In Kuruwita and Opanayake this payment is Rs. 100 (US \$1.8) per worker and Rs. 125 (US \$2) per head worker. However, in Pelmadulla it is Rs. 60 per worker (US \$1) and Rs. 75 (US \$1.3) per head worker. Along with the weekly allowance they are supported with meals at the mines. No daily emoluments are paid to them, as they are entitled to share the income of the mine for supplying their labour. However, every mineworker expressed the view that the living allowance that they receive is not at all sufficient.

Apart from the weekly allowance, a mineworker is entitled to about 3% of the gem income from a mine. Thus if a gemstone worth Rs.100,000 (US \$1,818) is found, he will receive a sum of Rs. 3,000 (US \$54). The income that these workers in the sample derived during 1998 from gems found is shown in table 23.

Table 23: Mineworkers' Income Derived from Gems during 1998

Income (Rs and US \$)	Number of Miners	Percentage (%)
< 5,000 (\$90)	14	47
5,001 - 15,000 (\$91-273)	10	33
15,001 - 20,000 (\$274-364)	4	13
> 20,000 (> \$364)	2	7
Total	30	100

According to this information, a large percentage, i.e. 80 percent had received Rs. 15,000 (US \$273) or less from gems. Another 13% of mine workers received an income between Rs.15,001-20,000 (US \$91-273)Only a small percentage (7%) had received an income of more than Rs. 20,000 (US \$364). The main reason for this disparity in income is the different levels of gem income in different mines. During certain years mineworkers had been able to obtain large sums of money as income. The miners reported that in 1995 a mineworker could expect to receive an income of Rs.100,000 (US \$1,818) as his annual share.

Since a mineworker is considered as a shareholder he is not supposed to work a specific number of hours as a daily waged earner. They work at a stretch from morning until evening. At times they have to work late hours in order to complete certain work. Apart from having to work continuously, they do not enjoy leave facilities

either. When a mine is dug up its work has to be continued non-stop until the mine is exhausted. If a miner needs to be absent for any reason he has to send another person on his behalf, to be employed on daily paid basis.

3.3 Problems Encountered by Mine Workers

Mine workers in the area studied face many social and economic problems. They do not receive any return other than their weekly allowance, free food and the share of final income. The weekly allowance is not at all sufficient for the sustenance of their families. No action has been taken by the government or the National Gem and Jewellery Authority to compel the mine owners to pay them a sufficient sum. Apart from this the income generated from gems too has declined significantly in recent years thus further exacerbating their situation.

The Gem Buyers tend to collaborate with each other in order to maintain prices at an artificially low level. This means that the mine owners, and thus also the miners, receive a lower income. The miners also felt, however, that sometimes the mine owners themselves pretended that they received a low sum for their gems in order to cheat the mineworkers. There is an increased likelihood of this kind of cheating whenever the mine owner bears the full costs of a mine on his own without any shareholders, since he is able to sell the gems according to his own wish. It is evident that the mineworkers are exploited because it is not easy for them to estimate the value of gems and also because they have a poor knowledge about what properties generate value, and about the outside gem market.

The risky and dangerous nature of the mineworkers' employment is another problem they are faced with. Instances were reported where mineworkers had died of inhalation of poisonous air, slipping in shafts, collapse of shafts etc. At the time of a death of any mineworker, a mine owner rarely provides money for the funeral and does not pay any compensation to the family whatsoever. If the deceased is a married person then his family is likely to be put under great financial and emotional stress. Presently the Gem and Jewellery Authority has introduced an insurance scheme to cover the lives of miners and also the mine owners are now required to deposit a sum of Rs.120 (US \$2) per miner against insurance charges, prior to obtaining a licence. However as long as illicit mining goes on, miners of such places still have to face the aforesaid risks.

It was further reported that the physical strength of mineworkers deteriorates rapidly due to the fact that they have to work in deep mines without fresh air. This situation is further aggravated because they are unable to feed themselves with nutritious meals with their insufficient income.

In the case of mineworkers attached to river workings it was reported that they run the risk of having audio-visual disorders.

The absence of a pension scheme to support the mineworkers during their weakened stages, being unable to work any longer, was considered another problem faced by small-scale miners.

A summary of the aforementioned problems encountered by mineworkers is as follows:

- 1) Insufficient weekly allowance to sustain their families
- 2) Declining income generated by any gems found
- 3) Collaboration of gem buyers to maintain artificially low prices
- 4) Vulnerable to being cheated also by the mine owner
- 5) Health and Safety risks to themselves
- 6) In the event of death a mine owner does not always pay funeral costs to the family, and almost never compensates them
- 7) In the event of injury the miner is not compensated or cared for (particularly if they are involved in illegal mining)
- 8) Deteriorating physical condition due to cramped and claustrophobic working conditions
- 9) Insufficient allowance to allow nutritional diet
- 10) Audio-visual disorders (particularly from river working)
- 11) Lack of a pension to support them when they are weak and/or too old to mine

4. NEEDS ASSESSMENT OF MINE OWNERS AND MINE WORKERS

4.1 Training Needs of Mine Owners

A training needs assessment was undertaken to identify what the mine owners felt wish would benefit them and support them to overcome the difficulties they are faced with. The type of information and training needs according to their preferred order are listed in table 24.

All the mine owners in the sample were of the view that there was no specific method to explore whether gem deposits are present in a particular place. Accordingly, selection of a site for mining depends entirely on the owner's guess. Furthermore, they were also of the view that the continuation of mining for a long period of time has largely exploited the existing gemstone deposits in these areas making mining a less worthwhile operation. All the mine owners, therefore, expressed their eagerness to receive information and training on how to explore and prospect for gemstone deposits.

Table 24: Identified Training Needs of Mine Owners

Type of Information preferred	Number in favour	Percentage (%)
How to prospect/explore for gemstone deposits	12	100
How to determine the correct value of gemstones and market the same	11	92
Repair and maintenance of equipment/machine	9	75
Small business management	8	67
Mining laws and regulations	2	17
Labour regulations	2	17
Geuda heat-treatment	2	17
Bookkeeping	1	8

The market value of a rough gemstone depends on several factors as expressed by mine owners. They are:

- (a) The colour, weight, quality (i.e. no cracks) and the extent of the gem that could be used for a final product
- (b) The value and demand for the particular gem variety in the international market
- (c) The bargaining power of the seller and the buyer

Many mine owners felt that lack of knowledge in the first two areas had paved the way to the present day problem they face of the inability to obtain a satisfactory price for their production. Therefore 92% expressed their eagerness to find out how to determine the correct value of gemstones and thus determine the market price. It is of significance that some mine owners who were also engaged in gemstone purchasing enterprises also expressed this need.

The use of machinery in mining is limited and many of the activities are carried out by manual labour. However, for the pumping of water accumulated in mines and to supply air for tunnels mine owners need to make use of mechanised pumps. At times of breakdown of such machinery repairs may take a number of days. Hence 75% of those interviewed wished to study the repair of such equipment which would enable them to attend to failures immediately.

The irregularity of production, decline in the income and risky nature of mining investments have resulted in many mine owners facing a difficult situation. 67% of mine owners therefore felt that training on small business management would be beneficial to them and their workers.

Mine owners were less interested in topics such as how to identify rocks, gemstone and other minerals, mining laws, labour regulations, gemstone mining methods and bookkeeping.

Among the mine owners only a few (17%) felt it necessary to know the mining laws and labour regulations. Others held the view that necessary information regarding mining laws and labour regulations had been provided to them with the licence issued by the National Gem and Jewellery Authority. Bookkeeping is another area that mine owners showed less interest in learning more about (only 8%). Many of them said that they are already involved in doing their own accounts and their so their existing knowledge was sufficient for that purpose.

None of the mine owners felt it necessary to learn how to identify rocks, gemstones and other minerals, or gemstone mining methods. They were of the view that gemstones can be easily be identified by their weight and colour from other minerals and rocks. The gemstones are sorted by washing the gravel extracted from the gemstone deposits in circular wicker baskets. Due to the weight of gemstones and other minerals they remain at the bottom of the basket in the washing process.

Mine owners also felt they had sufficient knowledge on gemstone mining methods for small-scale mining. Many of them expressed their fear of introducing modern technology for mining, which would diminish the existing deposits in a short while. Therefore, all the mine owners were satisfied with the traditional mining methods they were presently following. Other than the above-mentioned areas of training, another two people did express interest in learning about heat-treatment of Geuda stones. Such knowledge would enable mine owners to add-value to the gems and thus increase their income rather than selling geuda stones to buyers at low prices.

Overall the mine owners felt that the most valuable areas of training they could receive were on how to explore and prospect gemstone deposits, how to determine the correct value of the gemstones and how to market them, repair and maintenance of equipment and small business management.

4.2 Mode of Training Delivery preferred by Mine Owners

The mine owners suggested that the best way of training delivery for them was classroom style training (68%), see Table 25.

Table 25: Style of Training Delivery Preferred by Mine Owners

Mode	Number of people	Percentage (%)
Class room type training	8	68
On the job training	2	16
Distribution of posters & leaflets	1	8
Videos and films	1	8
Total	12	100

Most of the mine owners held the view that on the job training would not be possible due to lack of time at work. There were only two people who preferred that mode of training. According to them, posters or leaflets would not be very effective, as they

would not be interested in reading such information. Only one person interviewed proposed videos and films as a method of providing information. Interestingly none of the mine owners were willing to undergo any training through the observation of other operations. Classroom style training was deemed the most acceptable to the mine owners.

4.3 Training Needs of Mine Workers

At present the main problems faced by the mineworkers are insufficient income, exploitation by mine owners, health and safety threats, and the absence of any retirement benefits. 87% of the mine workers had been involved in the industry for more than five years and therefore had considerable knowledge of the field, however they expressed interest in knowing more about several areas (see Table 26).

Table 26: Type of training and information preferred by Mine Workers

Type of information preferred	Number in favour	Percentage (%)
How to determine the correct value of gemstones	26	87
How to apply first aid	21	70
How to prospect/explore for gem stone deposits	21	70
Labour regulations	18	60
Mining regulations related to gemstone mining	18	60
How to use explosives	5	17
How to support underground workings and shafts	4	13
How to mine/extract gemstones	3	10
Lapidary industry	3	10
How to identify rocks, gemstone and other minerals	2	8

Mineworker being a shareholder of a mine is likely to share certain similar needs as the mine owners. For instance, both sets of people wished to learn how to determine the correct value of gemstones and how to explore/prospect for gemstone deposits. Among the mine workers interviewed 26 people (87%) expressed willingness to learn this because they were unable to assess the correct value although they knew that the value of a gemstone is determined by the colour, weight and quality. They were of the

view that poor knowledge in this area contributes to them being exploited by buyers and sometimes by the mine owners. Accordingly, they ranked valuation of gemstones their highest priority.

All the mine workers thought that there was no method of exploring for gemstone deposits prior to deciding an exact place to be dug – they all felt it to be solely dependent on guessing. According to them gemstone deposits are mostly located along with rivers and canals, in lands of close proximity to such reservoirs and low lands in these areas. Some of them also pointed out that deciding on a site to mine is the responsibility of the mine owner. However, 21 people (70%) felt that it would be useful to undergo training on how to explore for gemstone deposits.

Among the mineworkers interviewed 70% were interested in learning how to apply first aid. This was due to the frequent accidents encountered by them whilst working in the mines. According to them such emergencies are frequently caused by exposure to unhealthy and poisonous air in deep mines. As there is no system of first aid to help mineworkers cope with the hazards of their work they were very keen to learn such skills.

60% of mineworkers said that they were unaware of either labour regulations or mining laws and wished to obtain information on these areas. This could be due to the fact that only the mine owners were responsible for ensuring the legal requirements of the mines were fulfilled. However some of the others were not keen to know about labour regulations through fear that it could lead to their dismissal by mine owners in an attempt to safeguard their legal rights.

Mineworkers did not show much interest in areas such as how to use explosives (17%), how to support under ground workings and shafts (13%), how to mine and extract gemstones (10%), and how to identify rocks, gemstones and other minerals (7%). The majority of them were of the view that they already possessed sufficient knowledge to carry out such activities. Furthermore, none of the mineworkers have expressed their interest to undergo training on how to operate equipment and machines or how to repair and maintain machinery. The water pump was considered simple and easy to operate and maintain. The mine owners generally owned such machinery so none of the workers were interested in carrying out such maintenance. 10% of the miners thought that knowledge of the lapidary industry would be useful to them.

It was evident that areas of training such as how to determine the correct value of gemstones, how to explore and prospect gemstone deposits, how to apply first aid, mining laws and labour regulations were considered to be most useful to help improve the conditions of mine workers.

4.5 Style of Training Delivery Preferred by Mine Workers

Table 27 depicts the opinions of mineworkers regarding the best way of getting such information to them.

Table 27: Style of Training Delivery Preferred by Mine Workers

Style of Training Delivery	Number of Miners	Percentage (%)
Classroom type training	12	40
On-the-job training	12	40
Distribution of leaflets	4	13
Through local organisations	2	7
Total	30	100

The mineworkers agreed with the mine owners' feelings that their preferred mode of receive information was through classroom type training. Miners equally felt on the job training to be valuable, in contrast to the mine owners who felt this would waste valuable work time. Only a 13% of mineworkers showed an interest in leaflets and posters. Those who proposed local organisation to mediate training pointed out that the Samurdhi Development Societies could be used for such a purpose. As 80% of mine workers were receiving Samurdhi poverty alleviation benefits it could be possible to organise workers under this organisation at the village level.

5. Conclusions

Gemstone mining in the study area was carried out on a small-scale basis using manual labour and traditional technology. The organisation of the industry is based on a co-operative system and production sharing.

A decline in the available area of gemstone deposits, a decline in the income generated, an increase in the cost of inputs, a shortage of capital, and difficulties in obtaining licences were some of the problems encountered by small-scale mine owners. No sufficient measures have been taken by the National Gem and Jewellery Authority to overcome these problems.

Mine owners were interested to undergo training on how to explore for gemstone deposits, how to determine the correct value of gemstones, small business management and repair and maintenance of equipment.

The majority of the mineworkers belonged to low income families and had very poor living conditions. The lack of a regular income, shortage of gemstone deposits and the decline in the price obtained, exploitation by mine owners, hazardous operation in mines, and the lack of pension and insurance coverage during their old age were some of the problems encountered by mine workers.

Mine workers expressed most interest in participating in training on how to determine the correct value of gemstones, how to apply first aid, how to explore for gemstone deposits, and mining laws and labour regulations.

Both the mine owners and mine workers preferred a classroom style of training delivery on a non-work day. However, mine workers also felt that on-the-job training methods would be valuable to them.