TRAINING REPORT

Training on Cleaner Fired Clay Brick Production Practices

Mahendranagar, Kanchanpur

28-30 May, 2016

Prepared by:

Federation Nepal Brick Industries

MinErgy Pvt. Ltd.

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Contents

1. Introduction

Federation of Nepal Brick Industries (FNBI) in association with MinErgy Pvt. Ltd. Nepal, with support from Climate and Clean Air Coalition (CCAC) and International Centre for Integrated Mountain Development (ICIMOD), organized a training programme entitled "Training on Cleaner Fired Clay Brick Production Practices" from May 28-30, 2016 in Mahendranagar, Kanchanpur. The training programme is a part of CCAC brick kiln initiative aimed at achieving substantial reductions of black carbon and other emissions from brick kilns through employing a range of technology and policy approaches. This training is the last of four training programmes, which were scheduled to be organized at four different locations across the nation.

2. Objectives

Overall Objective

- To achieve reductions in black carbon and CO_2 emissions with their related co-benefits on development and health

Specific Objectives

- Establish training and technology nodes in Nepal to increase the rate of adoption of cleaner technologies through trainings and technical assistance explicitly aimed at building technical capacity in the region to move to lower emitting brick kilns
- Enhanced capacity of entrepreneurs and workers on the cleaner brick firing practices

3. Location and Training Period

The training was organized at Hotel Opera in Mahendranagar, Kanchanpur between 28-30 May, 2016. The theoretical part of the training was organized at the hotel, whereas the practical sessions were carried out at brick kiln, namely:

i. Shiva Shankar Itta Udhyog, Daiji, Kanchanpur

Nine resource persons (annex 1) were engaged in training delivery. Training included ten modules covering different aspects of brick production practices. Altogether, ninety six trainees participated in the training. The participants were from Banke, Dang, Bardiya, Kailali and Kanchanpur districts. The list of participants is attached in the annex 2. The training schedule is attached in the annex 3.

4. Training

4.1 Opening ceremony

The notables from ICIMOD, FNBI, MinErgy, Kanchanpur Brick Industry Association, Mahakali Brick and Tile Industry Association and Seti Mahakali Brick and Tile Industry Association inaugurated the training programme with words of welcome, appreciation and encouragement. Speaking first, the Vice-President of Kanchanpur Brick Industry Association, Mr. Fairu Tamang welcomed everyone on behalf of the Association. He said that all participants from several districts sought benefits from new improved brick production technology, and hoped that problems in brick kilns were addressed in the training programme.

The Co-Secretary of FNBI, Mr. Madan Raj Paneru welcomed all participants on behalf of FNBI. He told that new technology benefitted all kiln operators, and technical difficulties in adoption of improved technology should be overcome with joint efforts of all. Program Co-ordinator of MinErgy Pvt. Ltd., Mr. Sanu Babu Dangol welcomed and thanked everyone for participating in the training programme. He talked about the involvement of MinErgy in brick sector, and described the co-ordination between MinErgy, FNBI and ICIMOD for preparation of brick kiln design manual, outreach programs concerning new brick production technology, implementation of the design manual, preparation of training manuals and organization of nationwide training programmes to brick kiln owners. Mr. Dangol talked about the implementation of improved design for the construction of 9 brick kilns in Kathmandu valley, and believed the participants would learn many aspects of improved brick production practices through the training and implement them in their kilns.

The Co-Secretary of FNBI, Mr. Rajkumar Hamal welcomed all participants and thanked organizers for conducting training for the benefits of brick entrepreneurs. Mr. Hamal believed the training would be a path-shower to participants, and they would feel social responsibility towards pollution reduction, occupational health and safety and abolishing child labor. The Secretary of FNBI, Mr. Shankar Bahadur Chand welcomed everyone and told that motto of the program is to direct brick kiln owners towards cleaner production along with economic benefits to them. He told the participants that the training would include theoretical as well as practical aspects, and thanked the reporters for coverage of the programme.

The President of FNBI, Mr. Mahendra Bahadur Chitrakar stated that FNBI aimed for advancement of brick kilns in Nepal by solving several problems and issues in the sector. He called for social responsibility of brick kiln owners and told that the owners themselves should be aware of improved brick production technology. Mr. Chitrakar acknowledged that technical personnel are engaged in continuous technology research and development in brick sector. He highlighted the need of technology advancement for development of brick industry, and told that plans for training of supervisors for stacking and firing are in progress.

The Associate Coordinator of Atmosphere Initiative, ICIMOD and Chief Guest of the opening ceremony, Mrs. Bidya Banmali Pradhan talked about involvement of ICIMOD in brick kiln sector. She talked about the effects of emissions (CO, CO_2, black carbon) in environmental degradation and mountain degradation and told that brick industry is one of the sectors responsible for it. Mrs. Pradhan gave assurance that ICIMOD would always cooperate with FNBI for continuous development of brick sector along with emission reductions from kilns, and highlighted benefits such as coal consumption reduction, improved brick quality and emissions reduction from zigzag technology. She talked about different modules to be presented in the training, and believed the training would be beneficial to trainees.

The Chairman of the opening ceremony and President of Mahakali Brick and Tile Industry Association, Mr. Prakash Rawal thanked FNBI, MinErgy and ICIMOD for organizing the training program. Mr. Rawal talked about technology transformation of brick kilns from movable chimney kilns to straight line FCBTK to zigzag kilns, and believed it was necessary to grasp new technology with time to adapt with new necessities. He believed trainees would gain much technical knowledge from the training programme and also thanked the journalists for coverage of the programme.

4.2. First day

Mr. Bhishma Pandit started first day of the training with module on Brick Firing, Fuel and Combustion. He presented about brick firing process, fuels used in brick kilns, fuel characteristics and combustion process. He also explained about fuel management and heat balance for energy efficient firing and pollution reduction. Mr. Pandit interacted with participants about fuels used in kilns in Far-Western region, calorific values of several fuels and ways to determine which fuel should be used. He explained about single-man, z-pattern, continuous feeding, and talked about its advantages in coal consumption reduction and emissions reduction.

Some of the queries presented by the participants during the session were:

- Spoon size and coal quantity to be fed in zigzag firing
- Appropriate coal feeding intervals in straight line firing

Next module on Soil preparation was presented by Mr. Sanu Babu Dangol. He explained about brick making process, types of soil, soil quality, soil testing and soil preparation. Mr. Dangol advocated on the importance of soil selection and soil preparation for good quality of green and fired bricks.

The subjects of discussion during the session were:

- Methods of soil testing

- Steps in soil ageing
- Methods of internal fueling and shrinkage in internally fueled bricks
- Formation of white substrate in fired bricks
- Effects of mixing salt in clayey soil
- Methodology for mixing different types of soil for ideal soil preparation
- Breakage problem in green and fired bricks
- Improvement in color of fired bricks

The Co-ordinator of Technology Research and Development Committee (TRDC)/ FNBI, and owner of Rajdhani Bricks, Dhading, Mr. Shyam Maharjan shared his experience on soil preparation and its benefits. He told the participants that he suffered from 40-50 % breakage of green bricks for 2 years of operation of his kiln, but after proper soil seasoning, the breakage had reduced to just 5 %.

After the module on Soil Preparation, Mr. Shyam Maharjan and Mr. Santosh Gautam presented on Zigzag stacking. The presentation focused on components of brick stacking, differences between straight line stacking and zigzag stacking, and contrasted between natural draught zigzag stacking and induced draft zigzag stacking. They explained about the types of zigzag stacking, selection of zigzag type as per dug width, chamber sizes, and highlighted the advantages of zigzag stacking on proper combustion, fuel consumption reduction, emission reduction and quality bricks production. They discussed ways of changing stacking pattern such as changing area of openings, *paya* size, stacking height, etc. as per requirements to control the quality of fired bricks.

Great enthusiasm was shown by the participants in discussion during the session. The subjects of discussion were:

- Cost of set up and cost of operation of zigzag kilns
- Emission standards for different types of kilns
- Technical difficulties in operating zigzag kilns and their solutions
- Ill-practice of zigzag stacking and firing and its effects on bricks quality and coal consumption
- Clamp kilns and their abolishment by the government
- Chimney dimensions required for natural draught zigzag kiln
- Length and dug width of zigzag kiln
- Cooling zone length required for proper cooling of fired bricks
- No. of bricks in a chamber

The owner of Shree Kedar Shakti Itta Udhyog, Kanchanpur, Mr. Narad Pandey shared his experience to the trainees about the adoption of zigzag technology. He told the participants about

set up cost, challenges and difficulties in adoption; and advantages from zigzag technology in fuel economy, emissions reduction and increase in quality and quantity of production.

The supervisor of Shiv Shankar Itta Udhyog, Kanchanpur, Mr. Brij Chand also shared his experience about adoption of zigzag technology. Mr. Chand told the participants that zigzag technology is far better than traditional straight line practice, and all brick kiln owners should adopt it. He stated that though setup cost (fixed cost) of zigzag kiln is higher, operating cost (variable cost) is considerably lower, which eventually provides economic benefits, to go with environmental benefits. He told the participants that all brick kiln owners should be aware and keep technical knowledge on operation of their kilns. He stressed that kiln management is the most important aspect in operating a zigzag kiln, and kiln operators should be directed towards lowering production costs. Mr. Chand highlighted increase in percentage of first class bricks, reduction in breakage and reduction in coal consumption as major benefits received by him from adoption of zigzag technology.

The final session on first day included presentation on Best Practices in Operation (Straight Line and Zigzag) by Mr. Bhishma Pandit. He explained about the best practices in brick kilns that can be adopted for better performance of the kiln, which included brick setting, fuel mix and firing in zigzag kilns, reduction of leakages and heat losses, maintaining chimney draught, proper fuel feeding patterns in straight line and zigzag stacking, coal storage, etc. Mr. Pandit explained about advantages of building shed in brick kilns, and clarified that the cost of construction of shed is reimbursed by other cost benefits from it.

Some of the queries presented by the participants during the session were:

- Labor workforce required in zigzag kiln as compared to straight line FCBTK
- Thickness of *rabish* required for proper insulation

4.3. Second day

The second day of the training programme started with presentation on Design and Construction of Improved Fixed Chimney Bull's Trench Kiln by Mr. Tonil Maharjan. He highlighted processes followed to develop new design of natural draught and induced draught kilns and different aspects of new design. Mr. Maharjan explained about dug size, chimney design, *miyana* design, outer wall design, dug floor construction and centrifugal fan.

The subjects of discussion during the session were:

- Construction of main nali and side nali
- Construction material for chimney
- Thickness of chimney wall

- Depth of chimney foundation beneath ground surface
- Life of fibre coated metal chimney
- Heat loss through soling (ground surface)
- Benefits of using aluminium foil in soling
- Possibility of using fan in straight line stacking
- Customization of brick kiln design according to production capacity required

Mr. Nabin Chaudhary, the Managing Director of Yours' Technology Pvt. Ltd. (YT) presented on Brick Management System (BMS) software. He presented about various features of the software, its application for easy and efficient brick kiln management and about the collaboration of YT and TRDC/FNBI for development, trial and distribution of the software among various brick kilns in Nepal. He also talked about employee identification device (RFID machine) that can be used along with the software. He explained about modifications in the software that can be done as per the requirements of individual kiln.

Some of the subjects of discussion during the session were:

- Use of RFID card to keep account of green brick loading and fired brick unloading
- Price, maintenance and commissioning of BMS software
- Network management including CCTV cameras, walkie-talkie, intranet, etc.

After the module on Software and Data Management, Mr. Tonil Maharjan presented on Kiln Management. He presented on infrastructure and physical planning, administrative management, operational and financial management, and highlighted the importance of kiln management for better efficiency and better economy of the brick kilns. Mr. Maharjan advocated on the importance of new improved technology and good kiln management for economical and energy efficient production of better quality bricks and pollution reduction from kilns.

Mr. Shyam Maharjan shared to the participants about kiln management in his kiln. He shared about labor management, infrastructure management, operational management and financial management in his kiln. He interacted with the participants about importance of kiln management, child labor issues and child care centres in brick kilns.

Some of the subjects of discussion during the module on Kiln Management were:

- Labor management
- Child care centres
- Chimney height for proper discharge of flue gases
- Use of spray system and water reservoir in chimney for gas absorption

The next presentation on Zigzag Firing was presented by Mr. Santosh Gautam and Mr. Shyam Maharjan. They explained about firing zone, temperature profile of firing subzones, types and

quantity of fuel fed for different subzones, calculation of fuel consumption, heat losses, fuel feeding pattern and firing report.

The session was quite interactive and some of the subjects of discussion during the session were:

- Single man, z-pattern, continuous feeding and its advantages
- Quantity of fuel feeding in different firing subzones
- Methods of improving the quality of fired bricks in *paatan* (uppermost surface) and *godiya* (lowermost surface)
- Ways of balancing heat if rate of stacking is less than required or if stacking is halted for few days
- Position of fire in different firing subzones and getting control over fire movement
- Vitrification process and coal consumption

After the session on Zigzag Firing, the participants were taken to Shiv Shankar Itta Udhyog, Daiji, Kanchanpur for practical demonstration of zigzag stacking and firing processes. The participants were handed stacking sheets to help them for clear visualization of stacking process. Mr. Shyam Maharjan, Mr. Santosh Gautam and Mr. Devendra Maharjan helped them understand the components of stacking such as *paya, jhiri, jodi, bandhan, jali, tawa, gates*, etc., and components of firing such as firing subzones, temperature profile of firing zone, fuel types for different subzones, cooling and pre-heating zones, heat losses, leakages, etc.

Some of the highlights of the practical session were:

- Participants learned to stack bricks as per sheet provided
- Better understanding about the position of *bandhan, jodi, jhiri, tawa* and their importance to the brick production
- The participants learned about the position of fire in the firing zone, fire movement pattern and distribution of heat in different zones of the kiln including preheating and cooling zones.
- The temperatures of different subzones of firing zone were taken by the use of thermocouple device and radiation gun.
- The participants were explained about increasing or decreasing the rate of fire movement in the kiln so as to control heat for better production.
- The use of fuel, its type and feeding patterns for heat movement and heat control were also explained in the kiln.

4.4. Third day

The third day of the training started with presentation on Mechanization by Mr. Sanu Babu Dangol. Mr. Dangol highlighted potential mechanization options at different brick production

processes. He explained about the availability of various machines used in kilns for different purposes in Nepal, and shared briefly the history of development of green brick machine by Innovative Machineries Nepal Pvt. Ltd. He also conveyed to the participants through his presentation that brick kilns abroad are fully mechanized, which has enhanced the production capacity of those kilns.

The subjects of discussion during the session were:

- Soil feeding method in green brick machine developed by Innovative Machineries Pvt. Ltd.
- Cost of the machine, production capacity, installation and commissioning service
- Number of trolleys required for operation of the machine
- Total space required for operation of the machine
- Auto coal feeding machine and its application in Nepal

There was a short presentation by the Section Chief of the Office of Cottage and Small Industries (OCSI), Kanchanpur, Mr. Hemanta Bahadur Singh. He explained about registration process of brick kilns, documents required for renewal, industry expansion and transfer of ownership, Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), steps for taking permission of Office of Forestry for setting up brick kiln, etc.

Mr. Sagar Adhikari presented on Occupational Health and Safety (OHS) and Environment. Mr. Adhikari explained about the importance of occupational health and safety in brick kilns and environmental issues associated with brick kilns. He stated that improvement in occupational health and safety of the workers in the kilns, would result in greater efficiency in production and lower hazard costs, which directly benefit the brick kiln owners. He also conveyed about the environmental emission standards that are set by the government for all types of brick kilns in Nepal.

The subjects of discussion during the session were:

- Source and path control of air pollutants in brick kilns
- Personal protective equipments (PPEs) and their costs
- Availability of safe drinking water for workers in the kilns
- Position of porthole in chimney for emission measurements
- Child care centers and schooling of children in brick kilns

After the module on OHS and Environment, brick entrepreneur and member of TRDC, Mr. Devendra Maharjan shared his experience on operation of zigzag kiln. He told the participants that he practiced straight line FCBTK for four years, and ultimately had to abandon business due to loss. He told that he later practiced zigzag technology but co-ordination with his partners was difficult initially, and after smooth operation, the benefits of zigzag technology were tremendous.

Mr. Maharjan told the participants that coal consumption reduction in zigzag kiln makes up for all investment costs.

The final module on Weather Forecast was presented by Mr. Pradip Dangol. He explained about the importance of use of weather forecasting in brick kilns for smooth operation and minimization of production loss due to rainfall. The subjects of interaction during this session were:

- Types of rainfall and their forecasting
- Use of weather forecasting websites and applications, and their accuracy

4.5. Closing ceremony

At the end of the training programme, a training evaluation form, attached in annex 4, was distributed to the trainees to collect their feedback and response.

At last, a short, formal closing ceremony was conducted to mark the termination of the training. The members of different district brick industry associations first spoke on the occasion. Member of Banke Brick Industry Association, Mr. Tara Bahadur Khatri thanked organizers and trainers, and hailed the training as comprehensive and beneficial. He told that the training was helpful in coal consumption reduction, pollution reduction and kiln management. Mr. Khatri sought technical personnel in every district brick kiln associations for new technology implementation, and highlighted mechanization, coal consumption calculation, temperature measurement, zigzag stacking and firing as major learnings from the training. The member of Dang Brick Industry Association, Mr. Thakur Prasad Mahara stated that such training programs should be organized from time to time. He told that local manpower should be focused, and FNBI and other organizations should train local manpower for operation of zigzag kilns. Similarly, Mr. Surendra Kothait spoke on behalf of Kailali and told that the training was beneficial, and with new technology, better production could be achieved with energy efficiency and pollution reduction. He stated that new technology should be implemented by all entrepreneurs, and told that he would implement it in his kiln. Lastly, the member of Kanchanpur Brick Industry Association, Mr. Narad Pandey thanked organizers, trainers and participants. Mr. Pandey highlighted soil preparation, zigzag stacking, zigzag firing and coal consumption reduction as major learnings from the training. He urged all brick entrepreneurs to gain knowledge on improved brick production methods and implement them in their kilns. He told the participants that OHS, facilities to workers, emissions reduction should be given importance and social responsibility should be felt.

The Secretary of FNBI, Mr. Shankar Bahadur Chand distributed training certificate and training materials in a pen drive to the participants, to appreciate their presence in the training programme.

Speaking next in the closing ceremony, Mr. Shankar Chand thanked trainers for imparting technical knowledge to the participants. He told the participation was good and brick kiln owners were interested in new improved technology of brick production. Mr. Chand hoped new technology would spread nationwide in short time and improved brick kilns would replace traditional kilns in near future. He thanked MinErgy and ICIMOD for continuously supporting FNBI, and requested young technical people to contribute in brick sector and help in nation development.

At last, the Chairperson of the closing ceremony Mr. Prakash Rawal thanked participants, trainers, and FNBI for coordinating all brick kilns all over the nation. Mr. Rawal felt that current time is the time for improved brick production technology for energy efficiency and emissions reduction. He shared his experience of visit to brick industries in Europe and complemented on the great extent of technology use there. He told that all entrepreneurs should seek continuous improvement in their kilns; and stated that he himself was motivated by the training and would adopt zigzag technology in next season.

5. Training Evaluation

Training evaluation was done by the trainees based on training evaluation sheet distributed just before the closing session. The participants expressed overall satisfaction on the training programme. The major feedbacks in the evaluation sheets are as follows:

a. The course content of the training programme was adequate and useful but some participants felt that duration of the training was short.

b. The practical demonstrations were helpful in clear visualization of theoretical aspects.

c. The quality of instruction of the trainers and practicality of the contents in presentations were good.

d. There was adequate interactions and discussions among the trainers and trainees.

e. The logistic arrangements were satisfactory.

f. Trainees were satisfied with the training program and most of them expressed eagerness and confidence to adopt new knowhow and skills in their kilns.

g. The major learnings of the trainees were reduction of fuel consumption, reduction of emissions, single man feeding, position of fire and fire movement, kiln design, heat losses and leakage

control, occupational health and safety, zigzag stacking and firing, mechanization, weather forecasting and use of IT in kiln management.

h. Suggestions were made to use simpler, more understandable language as much as possible, and provide more video-based training materials.

i. Suggestions were made for time to time organization of such training programs, and organization of training in every district.

j. The participants felt that more practical sessions should be incorporated in the training.

k. Suggestions were made for preparation of supervisors for zigzag technology, for mass participation of brick entrepreneurs in training, and for organization of interaction and experience-sharing programmes among brick kiln owners all over Nepal.

l. The participants sought technical support from FNBI in each district associations for smooth transfer of improved brick production technology.

m. Participants felt they require more understanding on soil preparation, coal consumption calculation, kiln design, mechanization, labor management, accounting and brick management system, zigzag stacking and firing and reduction of coal consumption in straight line firing.

n. The participants expressed their interest in BMS software, green brick machine, green brick and fired brick transportation mechanism, auto coal feeding machine, temperature measurement devices and kiln security system.

The average ratings of participants on various training aspects are presented below:

Sections		**Average rating**
A. Curriculum		
1	The course content was relevant and adequate	4.31
2	The materials distributed were adequate and useful.	3.71
3	The course was organized in a logical manner	4.06
4	I will be able to apply what I learned.	3.97
5	Did the field visit support the course objectives?	4.06
6	Duration of training	3.97

B. Resource Persons		
7	Overall quality of instruction	4.09
8	The presentations were interesting and practical	4.00
9	Participation and interactions were encouraged	3.75
10	Adequate time was provided for questions and clarifications	3.83
C. Logistical Arrangement		
11	Organization of the training/workshop	3.71
12	Accommodation	3.41
13	Travel arrangement to the Field	4.03
14	Food Arrangement	4.28
D. Training/workshop specific questions		
15	How do you rate the training/workshop overall?	4.13
16	The training/workshop is useful to me and I will apply the learnings and will share with staff back home	4.45

Annex 1: Team of Trainers

Name of Trainer	Organization	Module
Bhishma Pandit	Consultant/ICIMOD	Brick Firing, Fuel and Combustion Best Practices in Operation (Straight Line and Zigzag)
Shyam Maharjan	TRDC, FNBI	Zigzag Stacking Pattern(Natural and Induced) Zigzag Firing

Sanu Babu Dangol	MinErgy	Soil Preparation, Drying and Brick Size Mechanization
Tonil Maharjan	TRDC, FNBI	Kiln Design, Layout, Retrofitting and Planning Kiln Management
Pradip Man Dangol	ICIMOD	Weather Forecast
Sagar Adhikari	MinErgy	Occupational Health Safety and Environment
Santosh Gautam	TRDC, FNBI	Zigzag Stacking Pattern(Natural and Induced) Zigzag Firing
Devendra Maharjan	Brick Entrepreneur	Zigzag Stacking Pattern(Natural and Induced) Zigzag Firing
Nabin Chaudhary	Your's Technology	Software and Data Management

Annex 2: List of Participants

S.N.	Name of Participants	Industry/ Address	Phone No.
1	Bhishma Pandit	Consultant/ICIMOD	9851088900
2	Sagar Adhikari	MinErgy	9851184956
3	Sanu Babu Dangol	MinErgy	9841224812
4	Bidhya Banmali Pradhan	ICIMOD	5003222
5	Mahendra Bahadur Chitrakar	FNBI	9851033467
6	Tonil Maharjan	TRDC/FNBI	9841516676
7	Shyam Maharjan	TRDC/FNBI	9851032642
8	Pradeep Dangol	ICIMOD	9841259758

9	Devendra Maharjan	FNBI	9851038812
10	Amar Maharjan	FNBI	9841444948
11	Nirmala Baduwal	ICIMOD	9851193002
12	Hemant B. Singh	OCSI (Kanchanpur)	9848841261
13	Baldev Singh Budal	Pashupati Itta (FMBI)	9809494628
14	Binod Bhatt	Mahakali Brick Factory	9848968777
15	Badri Karki	FNBI	9841374925
16	Santosh Gautam	FNBI	9841411406
17	Nabin Chaudhary	Yours' Technology	9851158091
18	Keshav Raj Bhandari	Nepal Brick Industry Association, Banke	9858020529
19	Bhoj Raj Adhikari	Bageshori Itta Udhyog	9858024165
20	Gokul Prasad Parajuli	Laliguras Itta Udhyog	9858021601
21	Tara Bahadur Khatri	National Brick Industry	9858021873
22	Deep Bahadur Ayer	New Ganesh Brick	9858422198
23	Dhiendra Saud	Ganesh Itta Udhyog	9867214696
24	Indra Chaudhary	KR Udhyog, Kailali	9848518483
25	Ramesh Bista	Jagadamba Brick, Belauri	9806421017
26	Jay Bahadur Chand	Tripura Brick	9806493622
27	Shankar Bahadur Chand	Shiva Shankar Itta Udhyog, Kanchanpur	9858750138
28	Puran Pande	Kedar Shakti Itta Udhyog, Kanchanpur	522120
29	Ghanshyam Pande	Kedar Shakti Itta Udhyog, Kanchanpur	522120
30	Shiv Raj Pande	Suraj Brick	9858750261
31	Krishna Bahadur Ghimire	Sandesh Itta Udhyog, Kanchanpur	9814603225
32	Hari Narayan Rana	Chandra Surya Itta	9803431110
33	Birbal BK	Sandesh Itta Udhyog, Kanchanpur	9804613966
34	Mohammad Afroj	Sandesh Itta Udhyog, Kanchanpur	9809465868
35	Prakash Rawal	Bagmati Itta Udhyog, Kanchanpur	9858750223
36	Rajendra Awasthi	ABC TV	9851154300

37	Dhruva Raj Awasthi	Jansarokar Post	9848760272
38	Binod Kumar Shah	Jai guru Ganesh Itta Udhyog	9858420201
39	Surendra Kathayat	Khaptad Itta Udhyog	9858420555
40	Dhirendra Saud	Jay Ambe Itta Udhyog	9867204696
41	Narad Pande	Kedar Shakti Itta Udhyog, Kanchanpur	9858750098
42	Nar Bahadur Saud	Jay Durge Itta Udhyog	9858420223
43	Shyam Chaudhary	Garima Itta Udhyog, Kailali	9804610101
44	Madan Raj Paneru	Jay Kali Itta Udhyog Pvt. Ltd.	9759000627
45	Dambar Bahadur Bista	Kedar Itta Udhyog, Kailali	9848696400
46	Tarka Raj Awasthi	Anjil times	98488251
47	Deepak Raj Awasthi	Jansarokar Post	9848704793
48	Chudamani Aryal	Shuklaphata FM	9848723648
49	Binod Dhami	Sudur Sanchar	9801727278
50	Bhageshori Shah	Avenues TV	9865645280
51	Suresh Dhami	API Today	9848780650
52	Tej Prasad Aryal	Jamuna Itta Udhyog	9804695400
53	Rajendra Bhatta	Nagarik Daily	9848724877
54	Bhawani Bhatta	Kantipur Daily	9848727350
55	Amba Dutt Tiwari	Journal Times	9848740120
56	Bakhat Bahadur Bista	Laliratna Itta Udhyog, Kailali	9858422885
57	Jagat Raj Chaudhary	Parsu Itta Udhyog, Kailali	9858422949
58	Yagya Raj Bhattarai	Malakheti Itta Udhyog	9848579924
59	Shyam Raj Joshi	Malakheti Itta Udhyog	9800697454
60	Rajkumar Hamal	Raj Itta Tayal Udhyog, Kailali	9858421849
61	Janak Bahadur Saud	Manakamana Itta Udhyog, Kailali	9848517997
62	Lal Bahadur Bishworkarma	Pashupati Itta, Kailali	9801251800
63	Rajendra Bista	STS TV	9848720104
64	Ram Singh Thagunna	Nepal Television	9848751585

65	R Tamang	New Janta Itta Udhyog	9803773193
66	Ganesh Bhatta	Siddhi Binayak Baba Itta, Kanchanpur	9858422524
67	Yam Bahadur Tamang	Bhawani Itta Udhyog, Kanchanpur	9806444955
68	Fairu Tamang	Aakash Itta Udhyog, Kanchanpur	9801700788
69	M Shukla	Shiv Shankar Itta Udhyog, Kanchanpur	9806414199
70	Ishwor Chaudhary	Shiv Shankar Itta Udhyog, Kanchanpur	9810662828
71	Ram Dhyan Chaudhary	Shiv Shankar Itta Udhyog, Kanchanpur	9806433452
72	Ganesh Raj Oli	Balkumari Itta Udhyog, Kailali	9858422292
73	Purna Raj Oli	Subha labh Itta Udhyog, Kailali	9848463475
74	Dabal Rawal	Ramaroshan Itta Udhyog, Kailali	9848638569
75	Shankar Singh Rathore	Karnali Itta Udhyog	9858421631
76	Brij Kishor Chand	Shiv Shankar Itta Udhyog, Kanchanpur	9841297974
77	Sanjay Shahi	Malika Itta	9843799139
78	Dipak Bhatt	Kedar Shakti Itta Udhyog, Kanchanpur	9848732566
79	Kabiraj Lekhak	Kedar Shakti Itta Udhyog, Kanchanpur	
80	Basant Regmi	Manakamana Brick	9847481834
81	Kishan Dangi	Runika Brick	9857834048
82	Ghanshyam Adhikari	Mata Ambe Brick	9847829246
83	Rom Oli	New Manakamana Brick	9857830232
84	Suresh Basnet	Sewa Itta Udhyog	9857820205
85	Dipendra Singh Khatri	Ekata Itta Udhyog	9857834914
86	Sunil L.C.	JLC Itta Udhyog	9857821340
87	Hemraj Pande	Betal Brick	9749504545
88	laxmi Prasad Lekhak	Khaptad Brick	9815644366
89	Ishwari Pant	Suraj Brick	9848725974
90	Ganesh Bhatt	Shiv Shankar Itta Udhyog, Kanchanpur	9848738584
91	Thakur Prasad Mahara	Kishan Fixed Chimney Utta Udhyog, Dang	9857834116

92	Anil Budha	Kalika Itta Tayal Udhyog, Kailali	9801715345
93	Dharmendra Yadav	Shrijana Itta Udhyog, Kailali	9801725365
94	Latif Siddhiqi	Mata Ambikeswori Itta	
95	Nanda Lal Joshi	Bhagirath Itta Bhatta, Kanchanpur	9848660580
96	Ganga Dutta Bhatta	Shiva Shankar Itta Udhyog, Kanchanpur	9848738485

Annex 3: Programme Schedule

Training on Cleaner Fired Clay Brick Production Practices

Programme Schedule

Day 1	**9.00 - 10.00**	**10.00 - 10.30**	**10.30 - 11.30**	**11.30 - 13.00**	**13.00 - 14.00**	**14.00 – 15.00**	**15.00 - 15.30**	**15.30 – 16.30**
	Inauguration	Tea break	M1: Brick Firing, Fuel and Combustion (BP)	M3: Clay Preparation, Drying and Brick Size(SP)	Lunch	M2: Zigzag Stacking Pattern (Natural and Induced) - Theory (SM/SG)	Tea break	M4: Best Practices in Operation (Straight Line and Zigzag) (BP)
Day 2	**9.00 - 10.30**		**10.30 - 11.30**		**11.30-12.30**	**12.30-13.30**	**13.30-14.30**	**15.00 – 20.00**
	M6: Kiln design, Layout, Retrofitting and Planning (TM)		M10: Software Data Management (NC)/ Tea break		Tea M7: Kiln Management (TM/SM)	Lunch	M5: Firing (SM/SG)	M2: **Practical** – Zigzag Stacking Pattern (Natural and Induced) (SM/SG/DM)M5: **Practical** -Firing (SM/SG/DM)
Day 3	**9.00 – 09.30**	**9.30 – 10:30**	**10:30- 11.00**	**11.00-11.30**	**11.30-13.30**			
	M10: Policy (OCSI)	M8: Occupational Health Safety and Environment (SA)	M9: Mechanization (SBD)	M10: Weather Forecasting System (PMD)	Closing Session and Lunch	*BP: Bhishma Pandit; SBD: Sanu Babu Dangol; SM: Shyam Maharjan; TM: Tonil Maharjan; SA: Sagar Adhikari; SG: Santosh Gautam; PMD: Pradeep Man Dangol; DM: Devendra Maharjan NC: Nabin Chaudhary OCSI: Office of Cottage and Small Industries*		

Annex 4: Evaluation Form

तालिम/कार्यशाला मुल्याङ्कन फारम

विषय	सफा इटा उत्पादनका लागि अभ्यास तालिम
मिति	फागुन २९- चैत्र १, २०७२
आयोजक	नेपाल इटा उद्योग महासंघ र मिनर्जी प्रा लि

कृपया तल प्रस्तुत गरिएका सुचीहरुमा आफूलाई उपयुक्त लागेको अंकलाई गोलो घेरा लगाईदिनुहोला । ५ अंकले सबै भन्दा उत्तम र १ अंकले कम/खराब भन्ने जनाउँछ ।

पाठ्यक्रम		कम				बढी/राम्रो/अतिराम्रो
1.	प्रस्तुतीहरुको सान्दर्भिकता र पर्याप्तता	1	2	3	4	5
2.	वितरित तालिमका सामग्रीहरुको पर्याप्तता र उपयोगिता	1	2	3	4	5
3.	तालिम कोर्सको उपयुक्त ब्यवस्थापन	1	2	3	4	5
4.	तालिममा सिकेका ज्ञान सिप र अवधारणालाई व्यवहारमा प्रयोग गर्न सक्ने क्षमता	1	2	3	4	5
5.	स्थलगत भ्रमणले तालिमको उदेश्य पुर्ति गर्न कत्तिको सहयोग भयो ?	1	2	3	4	5
6.	तालिमको अवधि	1	2	3	4	5
स्रोत ब्यक्ति (Resource Person)		कम				बढी/राम्रो/अतिराम्रो
7.	समग्र प्रस्तुति र प्रस्तुतकर्ताको गुणस्तरियता	1	2	3	4	5

8.	प्रस्तुतिहरुमा रोचकता र प्रयोगात्मक पक्ष	1	2	3	4	5
9.	तालिममा उपस्थित ब्यक्ति र प्रस्तुतकर्तासंगको प्रश्नोत्तर सहभागिता र उत्साहजनक सहभागिता	1	2	3	4	5
10.	प्रश्नोत्तरका लागि छुट्याईएको समयको पर्याप्तता र प्राप्त जवाफमा स्पष्टता	1	2	3	4	5

		कम			बढी/राम्रो/अतिराम्रो	
	कार्यक्रम व्यवस्थापन					
11.	तालिम/कार्यशाला संचालन	1	2	3	4	5
12.	बासको प्रबन्ध	1	2	3	4	5
13.	स्थलगत भ्रमणको लागी यातायातको सुविधा	1	2	3	4	5
14.	खानाको प्रबन्ध	1	2	3	4	5

तालिम संग मात्र सम्बन्धित प्रश्नहरु	कम			बढी/राम्रो/अतिराम्रो	
15. समग्रमा यो तालिमलाई कसरी मुल्याङ्कन गर्नुहुन्छ ?	1	2	3	4	5
16. यो तालिम मेरोलागि उपयोगी छ र म यहाा बाट फर्केपछि तालिममा सिकेका ज्ञान र सिप मेरा कर्मचारीहरुसंग सह कार्य गरेर प्रयोगमा ल्याउाछु ।	1	2	3	4	5

थप टिप्पणी

1. यो तालिमले तपाईको अपेक्षा पुर्ति भयो ? भयो भने या भएन भने कसरी ? कृपया उल्लेख गर्नुहोला ।

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   _____

2. यो तालिमबाट तपाईले के प्राप्त गर्नुभयो ? कुनै ३ मुख्य उपलब्धिहरु सुचिबद्ध गरिदिनुहोस ।

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   _____

   _____

3. यस तालिमबाट तपाईलाई कुन पक्ष सबैभन्दा बढी उपलब्धिमुलक लाग्यो ? र कुन पक्ष कम उपलब्धिमुलक लाग्यो ?

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4. यस तालिमलाई अझ सशक्त बनाउन के कुरा थप वा परिवर्तन गर्नुपर्ला ?

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_____

_____

5. तपाईलाई तालिमको कुन पक्ष/पाठ्यक्रम / प्रसङ्ग मा अझ बढी जानकारी चाहिन्छ ?

_____

_____

_____

6. आफ्नो उद्योगमा कुन पक्ष यान्त्रिकरण गर्न चाहनुहुन्छ ?

7. अन्य केही टिप्पणी / विचार

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Annex 5: Some Photographs

Photograph 1: Inauguration of the training programme

Photograph 2: Participants of the training programme

Photograph 3: Discussion session during the training

Photograph 4: Practical demonstration of zigzag stacking

Photograph 5: Practical demonstration of zigzag stacking

Photograph 6: Practical session on zigzag firing

Photograph 7: Temperature measurement of firing zone

Photograph 8: Certificate distribution to participant

Photograph 9: Closing ceremony