EIE-06-256 REEPRO

Promotion of the Efficient Use of Renewable Energies in Developing Countries

Show Case documentation

Show Case No.: 12

Ban Man

Authors

December 2009

List of content

1 Show case documentation

Type of Equipment: (tick off the type)	PV	Solar Thermal	Biomass to Energy		
	✓				
Short name of Site: ຊື່ຫຍໍ້ສະຖານທີ່/ໂຄງການ:	Manh village, Mahaxay District. ບ້ານ ໝັ້ນ, ເມືອງມະຫາໄຊ				
Province: ແຂວງ:	Khammoune (Khammoune is coordinate with approximately 17° 25′ 0″ N, 104° 50′ 0″ E) ຄຳມ່ວນ				
Country: ປະເທດ:	Lao People's Democratic Republic ລາວ				
GPS position (for Google Earth): ພາກພື້ນ	South Asian geographic coordinates of 18°00'N latitude and 105°00'E longitude ອາຊີຕາເວັນອອກສ່ຽງໃຕ້				
Description of the project site (including travel description): ລາຍລະອຽດກ່ຽວກັບສະພາບຂອງໂຄງການ (ລວມເຖິງການເດີນທາງ)	As a distance from Vientiane capital to Thakhek district, Khammoune province is about 420km and from central Thakhek to Ban Manh is about 70 km which is located far from Mahaxay central district about 25 km and 15km from main road to village, with the horrible road condition access to the village. It is old and traditional villages that settled around 200 years ago, along with isolated village no bordering with other villages. There are 182 households which comprised by 1128 population, 288 females.There is one secondary school (from grade 1-5) which children attended school about 90% from total, and others has help parents working in a farm or no receive supporting from family.				
Year of purchasing:	Plan given was September 2009; however, on the July the training was conducting in the target areas, there was no installment				
Operator: (Name and address)	Village Off-grid Projects and Support (VOPS) Sub-contract: Individual Electricity Provider, Champhet village, Thakhek Distrtict, Khammuan Province, Lao PDR. (856-20 5924778)				
Planner: (Name and address)	The VOPS Office in Vientiane on + 856 21 453 361, or the VOPS contractor, IED – +33 4 72 59 13 20 a.shanker@ied-sa.fr				
Detailed description of the installation: (technology, function, benefit for training, etc. max 150 words)	The VOPS just financed SHS and ended in 2009. Because of no system were installed at Ban Mane village.				
Generated Energy service: (tick off the energy type)	electricity	heat	gas	light	
	✓				
Power output of installation: (kWel, m³ biogas, kW th, etc.)					
Financing* (tick off the financing type)	private investment	loan	donation	grant	
	-	-	-	-	
Investment costs in US$*	NA				

Maintanance costs in US$*	NA
Savings US$ per month	NA
Energy sale income in US$*	NA
Natural Resources available: ເງື່ອນໄຂທາງແຫລ່ງຊັບພະຍາກອນທຳມະຊາດ	Available resources: animal dung from cattle, water buffaloes and sun light. Even there is river nearby village, it is flat river and about 1,000m far from village
Current electricity access: ການເຂົ້າເຖິງພະລັງງານໄຟຟ້າໃນປະຈຸບັນ	No electricity access, almost they use 80% of totaling 182 households uses traditional torch (oil from tree mixed with dried wood), and other sometimes uses lantern
Current fuel consumption (kind and prices of fuels): ການຊົມໃຊ້ນ້ຳມັນເຊື້ອໄຟໃນປະຈຸບັນ (ຊະນິດນ້ຳມັນ ເຊື້ອໄຟ ແລະ ລາຄາ)	Diesel lamp (lamp tern) for lighting, fuel consumption is 2L/household/mon, charging battery for CDs about 15,000 kip for one time. Diesel cost: 10,000 LAK/l (0.8EUR/l) Gasoline: 11,000LAK/l (0.9EUR/l)
Current economic basis of the village: ພື້ນຖານເສດຖະກິດໃນປະຈຸບັນຂອງບ້ານ	They are 100% occupying on agricultural practice, especially growing rice, animal raise there are only 72 household (39%) of totaling hand tractors use for farming. ເປັນຊາວກະສິກອນໂດຍສະເພາະແມ່ນເຮັດນາ ແລະລ້ຽງສັດ ເຊັ່ນ:ງົວ,ຄວາຍ. ເກືອບ 72% ແມ່ນໃຊ້ລົດໄຖນາ. ເຊັ່ນ:ງົວ,ຄວາຍ
Heights of income in the village (estimate): ລາຍຮັບສູງສຸດຂອງບ້ານ (ຄາດຄະເນ)	Height income averaged 200.000LAK/month (15 EUR) a household and lowest about 50.000 LAK/month (4.1EUR). With these income are from selling rice and animals
Future plans for economic development: ແຜນການພັດທະນາເສດຖະກິດໃນຕໍ່ໜ້າ	Improve rice farming, they now request for irrigation access enable to do two seasonal farming.
Level of community support to such a project (political, financial, labour): ການສະໜັບສະໜູນຂອງຊຸມຊົນຕໍ່ກັບໂຄງການ ຄືທາງດ້ານ: (ນະໂຍບາຍ, ການເງິນ, ແຮງງານ)	Village committees will contribute as a labor and some financial to the project based to project's conditions. If there is any training or meeting, we can arrange in school or temple.
Amount of power needed (in Watt): ຈຳນວນພະລັງງານທີ່ຈຳເປັນ (ເປັນວັດ)	These only estimates roughly of electricity use monthly, the highest electricity need is 3,000 watt/month and lowest 1500 watt/month per household only lighting at night and CDs. (if two light bulbs/households spent in 2 hrs/day lighting)
Time frame in which power is to be provided (daily, project timeline):	Depending on daily spent to 2 hours for lighting which start at 6 PM to 8 PM. ໃຕ້ດອກໄຟມື້ລະຊົ່ວໂມງຊ່ວງ6ໂມງ-8ໂມງ

ໄລຍະເວລາໃນການສະໜອງພະລັງງານ(ເປັນປະຈຳ, ຂຶ້ນກັບໄລຍະຂອງໂຄງການ)	
Possible Technologies or combination to be applied: ຄວາມເປັນໄປໄດ້ໃນການສະໜອງທາງເຕັກໂນໂລຊີ	There are natural resource available applied as a solar, gasification, and biomass
Fotos (Site, main street, area, landmark, resources like river, etc.): ຮູບ (ສະຖານທີ່, ຖະໜົນຫຼັກ, ພື້ນທີ່, ເຂດແດນ, ຊັບພະຍາກອນເປັນຕົ້ນແມ່ນ້ຳ)	There is a road access and stream near village(1000 m). ມີທາງສຳຮອງເຂົ້າເຖິງບ້ານ, ມີຫ້ວຍຢູ່ໃກ້ບ້ານປະມານ 1000 m

Pictures:

Manh is in Mahaxai, Khammouane

Road only can access in drying season

Houses most shading by fruit trees

Primary school (grade 1-grade5)

Hand tractor most use for transferring

Cloth weaving for family

Traditional sawing for housing

2 Show case development and operation

2.1 Project side survey

As the REEPRO pilot community selection, it was very important to visit five communities and select one potential community for implementing as a pilot community project in Laos. In selection was base on the community that has no access to electricity yet, and it also has highly potential in development of renewable energy as well as to the community development. Therefore the project team had initiatively visited Ban Mane (or Mane village) which is located in Mahaxay district, Khammuane province. It is one of the villages interested and registered for Solar Home System (SHS) as a highest percentage 89,01% of totalling 182 households required use of SHS from VOPS project compared to other 4 villages.

Ban Mane village is located far from Mahaxay central district about 25km and 15km from main road to village, with the horrible road condition access to the village. This road is able to access only in drying season but in rainy season is cut off from outside. However, it is difficult for communication. It is old and traditional villages which settled around 200 years ago, along with isolated village no bordering with other villages. There are 182 households which comprising of 1128 population (588 women). The village is neither connected to the grid nor electrified by renewable energy sources. Presently they use car batteries an electricity source in their households. Charging of those car batteries is expensive and inconvenient therefore the villagers want another source of electricity.

Basic information

- **Village name**: Ban Mane, Xaybouathong district, Khammuane province
- **Population**: 182 households, 1128 people (women 588)
- **Location:** 15 km from the nearest upraised road and electrified villages. Village is an oval shape and stretched on 120 km^2. The village is located on the low hill with primary school and temple on the top (figure 1).
- **Infrastructure:**
    - Access by dust road (cleared path along the jungle), access in wet season would be problematic
    - Complete Primary school up to 5^{th} grade: 4 class x 8 m =32 m
    - Temple in the centre of the village
    - Water supply: some sallow wells and linked water (1,2 km length and insufficient supply in dry season due to low head and seepage flow under the weir)
- **Housing**: traditional wooden upraised stile houses of Lao Loum (Low land Lao) group with wooden, straw or galvanized steel roofing.
- **Occupation**: 100% farmers
- **Agriculture production** : mainly field rice, some plantation rice; **secondary crops** : maize, bean for self consumption
- **Husbandry**: 182 water buffaloes; 218 cattle; 218 pigs (usually 5 pigs per household if no animal disease occurred); poultry (usually 10-20 per household)

- **Income range**: 50,000-200,000 LAK/month;
- **Income Sources**: rice selling, livestock, forestry products
- **Favorability**: rich surrounding environment (good forests, enough arable land for all)
- **Difficulty**: surrounded by high rugged limestone mountain; bad road access; big fruit trees around the houses (as regarding to individual PV systems installation), which affect up to ~70% of total households
- **Facing Problems** : (1) lack of modern energy service (electricity), (2) high price of petroleum products; (3) animal diseases (pigs, poultry), (4) insufficient water supply in dry seasons, (5) difficult road access during the wet season;
- **Energy resources and consumption**:
    - **Cooking:** fuel wood from surrounding forests
    - **Lighting:** 80% of households uses traditional 'Kabong' torch[1], 20 % fuel lamp (consumption 2 litters /month for lantern torch);
    - **Fuel prices:** gasoline 11,000 LAK/Litter (1,20 USD/L) and diesel 10,000 LAK/L (1,09 USD/L)[2]
    - **6 diesel motor run rice mills;**
    - **30% households own mini truck; 20%-motocycle, increasing tendency**
    - **Electricity:** CDs, radio and TV are powered by car batteries, which get charged in the nearest electrified village by 15,000 K/time of charge (1,63 USD) excluding fuel cost for motorbike 15 km from village to main road; Usage time: 1 week
    - **Installed:** one solar home system **(50W). Planned:** to install 166 solar home system
- **Strong des ires of the villagers** : (1) be electrified; (2) better road access; (3) more reliable water supply; (4) prevention of animal diseases;

[1] Flammable mixture of 'Nhang' Tree Oil (tar) and saw dust

[2] 1 US$=9200 LAK

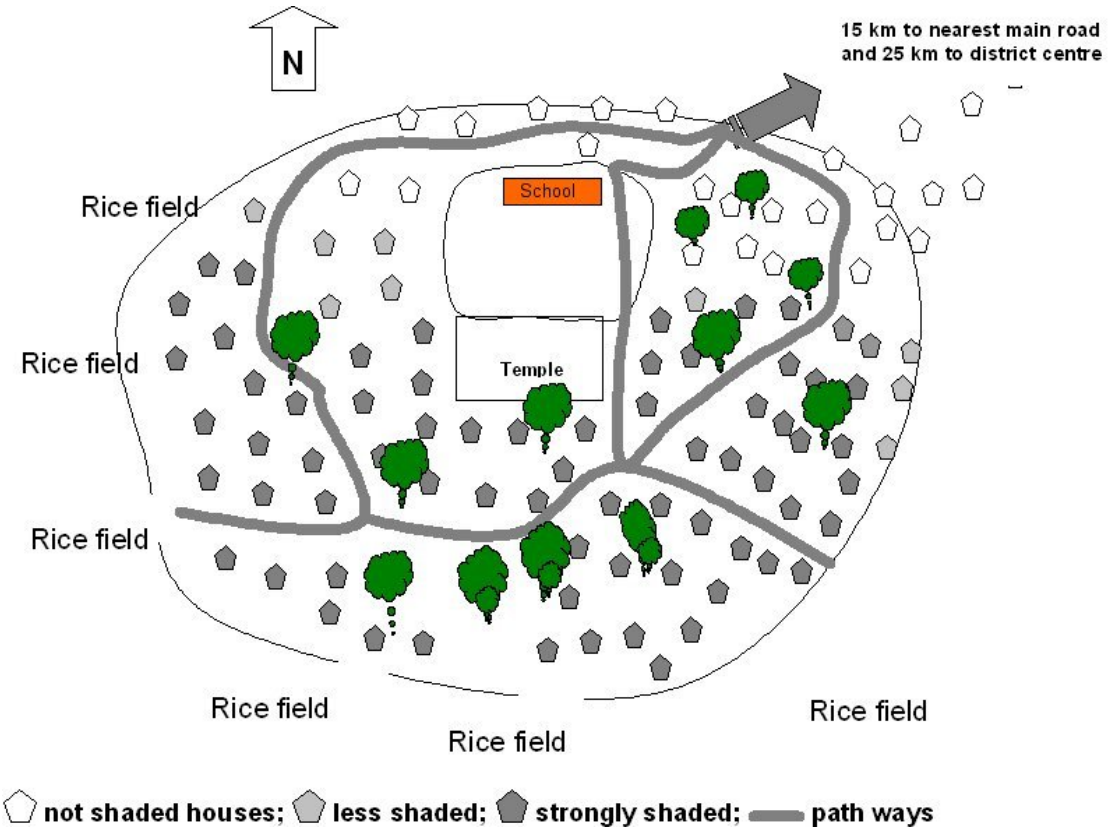

Figure 1: Master plan Ban Mane

On August 2008, the project team had visited the project communities for design and selection to conduct the pilot community in Manh village, Mahaxai District Khammuan. This village was located in isolate and surrounding with forest and line-mountains; however, there would be installed PV, within 166 households. The constraints to install PV on the roof was facing with the high and big fruit trees that would cause shading the panels and would be not fully obtain the heat as much it could. The project had thus commended (1) to Install one SHS station (220v) and connect line to households wanted, (2) install one battery charging station and users can bring battery to charge in one station and (3) install individual battery charging station where sun light can get such field of school, rice field. In the case the users have to buy two battery for switched charging.

2.2 Show case definition workshop

The REEPRO aim was to conduct the three different levels trainings, including the Levels 1 for expert, Level 2 for technicians and the Level 3 for stakeholders. This, given significantly, defined for the Level 2 and 3 that would be conducted in the pilot communities. Thus to define the project communities or pilot communities, the list of different categories had been defined and selected the appropriate, in connection with the promotion renewable energies and had high potential renewable energies program being installed. Khammuan and Manh village were identified by project that there would be soon installed the solar home system; however, they had no well-educated on the functioning and the system yet. The project team thus decided and jointly cooperated with the local operators, Off-grid project, to conduct the

trainings on two different levels. They are trainings for technicians and stakeholders, in particular focus on the PV and basic business dimensions.

This area was isolate and poor infrastructure, of which 15 km from the main road and the road was roughly small and poor. Significantly, it is one of the oldest villages; it is located in the surrounding with mountains and forest. It had no electricity and lack of state services access, especially market and information. Likewise, they had high potential to demanding for basic services, including electricity and information services.

PV was chosen to install depending on the high demand on the energies consumption and need to access information, along with lighting at night. While the PV was their choice, which was easily to install and possibly access by poor isolate areas, the prices was no cheapest for poor who had low income.

The constraints of Manh were located far from the main road and it was a single village, along with the river nearby could not possibly construct for generating electric power. To connect with gird was be considerable high cost, to provide for only 86 households, significant, they also had limitation of income to access the services to pay for extension gird. Beside that it was located with surrounding of mountains and forest; other renewable energies would not be a best choice in particular Wind power.

Like the other poor villages, Manh was mainly energy use depending on the natural resources, in specific on the firewood for cooking. Indeed the typical rural areas had rich access to natural resources, the biomass technology therefore would not be appropriate while people enjoyed and accessed easily to natural resources. In given, significantly, the number of livestock was rarely to use for generating energy sources, due to they were small number and were only for food consumption.

In define; there was high demand for the new technology, in particular on the solar home system that would be required by 89 percent of households to install on their houses. Its capacity requirement was defined differently, depending on the household purpose (at lowest 30 and highest 50 Wp).

PESCO[3] was the main key stakeholders and operators at the provincial level while the main operator at the village level was the village energy service providers[4] or electricity individual providers. The management system was in cooperate with the village energy service providers and village committee to follow-up and advise maintenance, along with collect paid-back services.

2.3 Showcase planning

Here are short concepts of some possible options, in case of Ban Mane electrification:

1) **Individual Solar hom e s ystems for all**: each of households will get solar home system at their house. But for proper installation of SHS, houses with significant

[3] PESCO: Provincial energy service company (established within WB-MEM off-grid projects)

[4] Usually one per village or villages cluster, acting on behalf of PESCO under off-grid program

shading will have to cut the fruit trees around the house. Significant shading would be counted as high as 50% of total number of houses (~90 houses).

2) **Central Battery charging station**: the best appropriate location is the west or south-west corners of the school yard or the PV array can be installed on the roof of the school building, which is facing right south. Proper management is crucial for reliable service. Problems: VOPS has no BCS option in its plan.
3) **Combination of the two earlier mentioned options**. There are several possibilities, as followed:
    a. Households with no or less shading can install normal SHS at their houses.
    b. Households with significant shading can choose a one of the following options:
        i. Install own solar systems outside, where appropriate: along the school or temple yard, bordering to rice filed areas. In this case: the systems slightly far away from their houses; the households with have to carry their battery for charging, as a rule- at least once a week.
        ii. Households with no or less shading may install additional SHS at their houses, and then offer battery charging service to neighbouring shaded households
4) **Hybrid system: small diesel gen-set + solar PV or other viable energy sources**. Some households have already owned small engine to run rice mill. They may combine rice milling and gen-set power generation, solar PV and then supply power to several nearby households through battery charging or AC electricity by mini-grid. Problems: high delivery cost of petrol, VOPS has no such options in its plans.
5) **Gasification power generation**. This is can be one of the viable option. Fast growing trees from the community surrounding forest or agro-forestry productions wastes can serve as a reliable biomass fuel sources. Problems: rather complicated unfamiliar technology in Laos
6) **Biogas**. Raw materials for Biogas production would be agriculture-husbandry-communal wastes. Problems: insufficient study of local raw materials, technology complexity, etc.
7) **Biofuel**. Oil plants: Jathropa, Sunflower. Ethanol production: sugar cane, cassava. Lack of information on local oil plants. Technology availability.
8) **Grid connection**. The nearest target of sooner electrification is located around 15 km far away from the project village. There currently not existing any villages in the middle points. For such distance, medium voltage (22 kV) transmission line would be needed in case of grid extension to the village
9)

The REEPRO team offered following options:

(1) to Install one SHS station (220v) and connect line to households wanted,

(2) install one battery charging station and users can bring battery to charge in one station and

(3) install individual battery charging station where sun light can get such field of school, rice field. In the case the users have to buy two batteries for switched charging.

The project had only conducted the trainings, on raising awareness, but no installations were made in the time frame of the REEPRO project.

Appendix 1: Project Side Survey

EIE-06-256 REEPRO

Intelligent Energy Europe

Promotion of the Efficient Use of Renewable Energies in Developing Countries

Visit Community Report

Authors

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CDEA

January 2008

The REEPRO project receives funding from the European Commission within the COOPENER Programme.

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List of Acronymes

CDEA	Community Development and Environment Association
DGS	Deutsche Gesellschaft für Solarenergie
NUOL	National University of Laos
SHS	Solar Home System
VOPS	Village off grid Promotion and Support

Etc.

1 Introduction

As the REEPRO pilot community selection, it is very important to visit five communities and select one, potential community for implementing as a pilot community project in Laos. In selection will base on the community that has no access to electricity yet, and it also has highly potential in development of renewable energy as well as to the community development. Therefore project team had initiatively visited Ban Mane (or Mane village) which is located in Mahaxay district, Khammounce province. It is one of villages interested and registered for Solar Home System (SHS) as a highest percentage 89,01% of totalling 182 households required use of SHS from VOPS project compared to other 4 villages.

Figure 1 Khammoune province

Khammoune is located in the middle part of Laos that share bordering bordering Bolikhamxay and Savannakhet Provinces. Khammouane covers about 16,000 square kilometers and has a population of approximately 330,000, mostly engaged in agriculture. The Mekong River Valley in the west is framed by the Annamite Mountain Range which separates Khammouane from Vietnam to the east. There are 9 district, including with Thakhaek, Mahaxay, Nongbok, Hinboun, Nhommalath, Bualapha, Nakai, Xebangfay and Xaybouathong.

1.1 Objective of Visiting Community:

- To visit and see the most potential community in development of renewable energy as well as community development, leaded to finally decision, as an available natural resources, high of community cooperation; long expand of electricity line and no electricity access.

1.2 Project team

On 3 to 4 January 2008 the project team that involved with in visiting;

- Mrs. Antje Klauss-Vorreiter and Dr. Kai Jan Kai Dobelmann, International Solar Society, German Section (GDS),
- Mr. Khampha and Mr. Bouangern, Community Development and Environmental Association (CDEA) and,
- Dr. Khamphone Nanthavong, National University of Laos (NUOL) had started visiting villages in Khammouane province, where one of interesting villages is Ban Mane in Mahaxay district, to see a potential development of project activities, along with community's long sustainability.

2 Description of Mane village

2.1 Location

Mane village is located far from Mahaxay central district about 25 km and 15km from main road to village, with the horrible road condition access to the village. It is old and traditional villages which settled around 200 years ago, along with isolated village no bordering with other villages.

Figure 2 Road access to village (15km)

This road is able to access only in drying season but in rainy season is cut off from outside. However, it is difficult for communication.

2.2 Social and economic

There are 182 households which comprising of 1128 population (588 women). They are 100% occupying on agricultural practice, and there are only 72 (39%) of totaling hand tractors use for farming. Otherwise, they almost base on traditional methods, use water buffalos. There is one secondary school (from grade 1-5) which children attended school about 90% from total, and others has help parents working in a farm or no receive supporting from family. For the income generation which mainly got from rice sold and husbandry sold averages highest 200.000LAK/month (15 EUR/month) and lowest 50.000LAK/month (4EUR/month). In which its price of rice sold based on market price 200LAK/kg (1.2EUR/kg).

Figure 3 Complete Primary School, children sawing timber

2.2.1 Energy use and natural resource

80% of totaling 182 households uses traditional torch (oil from tree mixed with dried wood), and other sometimes uses lantern. With high number use of torch because of the difficulty of road access in rainy season, they therefore use torch. Otherwise the high cost of fuel; gasoline 11000LAK/L (0.8EUR/L) and diesel 10.000 LAK/L (0.7EUR/L) and the average spent 2L/month estimated. There are 6 rice mills which only use rice husking not for electricity or TV, radio, CD at all. CDs, radio and TV are used battery which it cost for charging 15000LAK/time (1.14EUR/time) excluding fuel cost for motorbike 15km from village to main road.

Figure 4 Lantern use lighting and battery use for CDs

Its area covers about 120km^2 excluded more 15ha of cultivated areas and there is flat river nearby the villages (about 1000m far). There is the totaling number of husbandry; 218 cows, 182 water buffaloes, 236 pigs (normally if no animal disease averaged is 5 pigs/household), and animal raised most bases on traditional methods.

2.3 Plan of development villages

On the future plan for development of villages as priorities;

1. Improve roads access to be better condition
2. Improve the old water well and water supply
3. Get access of electricity

Mane village is one of target villages in Xaybuathong district of VOPS project, based on the VOPS plans about 166 household or SHS units of total 182 households which will be installed in Mane village.

2.4 Challenge of project

Figure 5 Fruit tree around households

Because SHS project will nearly operate in March, REEPRO project couldn't prepare and provide as a training level 3 based on project initiate plan. Otherwise, from observation vil-

lage there are pretty of fruit trees in which will cause some difficulty for installing SHS on the top roof that will hide the sun light. Otherwise, the VOPS plans installation of more than 400 systems in 5 villages in 1 year completed and it become a challenge.

3 Recommendation

As recommended of REEPRO teams visited for some solution of installing SHS options to avoid cutting down fruits trees and achieve plan

1. Install in the house but we have to cut tree down all households which will consume time
2. Install one SHS station (220w) and connect line to households wanted
3. Install one battery charging station and users can bring battery to charge in one station
4. Install individual battery charging station where sun light can get such field of school, rice field. In the case the users have to buy two battery for switched charging

4 References

Mr. Khamphat Soulinthon, manager, Individual Electricity Provider, Khammouane province, 2008,01.04