UNI EROPA

South Sumatera Forest Fire Management Project
Jl. Jenderal Sudirman No. 2837 KM 3,5 – PO Box 1229
Palembang 30129 – Sumatera Selatan – Indonesia
Telp: (62) 711-377821, Fax: (62) 711-353176
Email: ssffmp.eu@telkom.net

Industrial Extension

Assignment March – April 2007

Consolidate introduced technologies in priority villages, in particular for drying rice using rice husk. Define final measures for increased efficiency and sustainability

Finalize local production of fire fighting pumps in Indonesia for use with fire crews in South Sumatra

Gerald Hitzler

Final Report

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PREFACE (Assignment March – May 2007)

The South Sumatra Forest Fire Management Project (SSFFMP) is a technical co-operation project jointly funded (in terms of the financing memorandum IDN/RELEX/1999/0103) by the European Commission and by the Government of the Republic of Indonesia through the Ministry of Forestry (MoF).

This report has been completed in accordance with the project's Overall Work Plan (OWP) and the first Annual Work Plan (AWP I) and

For Community development

in part fulfilment of Activity ????…" Stakeholder generates income from agricultural activities by more use of mechanisation?????

For Fire fighting activities

in part fulfilment of Activity 2.4, "Purchase and distribute to relevant stakeholders locally adapted fire prevention, fire fighting and rescue equipment and train the fire crews in its use."

to achieve Result 2 "Stakeholders enabled to organize and apply fire management mechanisms in their areas."

to realise the five-year project purpose, which is "Aid and facilitate the establishment of a coordinated system of fire management at province, district, sub district and village level throughout South Sumatra province in which all involved stakeholders, including the private sector, work together to reduce the negative impact of fire on the natural and social environment."

The report has been prepared with financial assistance from the Commission of the European Communities. The opinions, views and recommendations expressed are those of the author and in no way reflect the official opinion of the Commission.

The report has been prepared by:

Gerald Hitzler

The report is acknowledged and approved for circulation by the SSFFMP Co-Directors

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Dr. Dodi Supriadi
National Co-Director

Dr. Karl-Heinz Steinmann
EU Co-Director

EXECUTIVE SUMMARY (RINGKASAN BAHASA INGGRIS)

Rice dryers

To support the community development in poor areas with low income, SSFFMP distributes and equips farmers groups of priority/selected villages with agricultural equipment and machinery as part of income generating activities. The additional income generation should support the reduction and prevention of forest fire.

The equipment like the flat bed rice dryers should be appropriate, of good quality and if possible locally produced. Local production of agricultural machinery and tools contributes to the creation of new job opportunities and employment. Further, additional know how got gained and developed among local production workshops.

Some places got visit where rice dryers are built and in operation. The dryers were partly good made, partly of bad quality and not very functional. It was obvious that further improvements and changes are necessary to improve performance and to reduce operational cost. A student from Nepal at present with SSFFMP surveyed some of the dryers and found out that most of them are not profitable operated. Reasons were partly poor construction of components, outdated technology, mistakes in operation and low prices charged for contract drying.

To improve the performance the project started to provide improved components like the design of a Vietnamese blower for testing and copying. First results were visible like in the case of the blower, one manufacturers started to copy and sell.

To deepen the view and to gather more information about drying and other post harvest technologies for rice, a team was sent over to South Vietnam for studying the situation there. Vietnam even as a lover developed country as Indonesia is more advanced in the field of post harvest technology.

Fire pumps production

The workshop involved in power pump production at Bandung Cimahi got visited two times again for some days for further support and advice. The last time ordered first batch of pumps was not complete finalized do to some problems. Some of the pumps send over to Palembang had some problems and got partly rejected. Attempts were made to repair the pumps and to improve and advise again in production.

The second batch ordered could not get finalized on time because of problems with the aluminium casting. The casting before was subcontracted to a bigger foundry. The place had problems with delivery on time and the quality of the cast was rough and of low standard. Used aluminium alloy was not as expected. Therefore the workshop producing the pumps had decided to do the casting by them selves again.

Together with the consultant the moulds got partly changed for improvements. Advice was given further on frame detail changes to improve the handling in operation. The delivered pumps got tested by project staff and found suitable for forest fire fighting in South Sumatra and other provinces.

RINGKASAN EKSEKUTIF

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1. INTRODUCTION

Rice dryer

SSFFMP distributes and equips some selected farmer groups, women groups of priority villages with agricultural equipment and tools to provide them the opportunity to generate additional income. The additional income should reduce the need to slash and burn forest for subsistence agriculture. The machinery should also support and intensify the production of cash crops on converted land and lead to a sustainable agriculture on this land.

In 2004 the project together with BPTP introduced a flat bed dryer to a farmer's cooperative at Upang village. The dryer's flat bed had a capacity of 4 ton, the rice husk stove was using a heat exchanger, the fan is driven by a diesel engine. During operation over two year it got obvious that the dryer has some problems. The blower was not lasting, the sheet metal of the stove got quickly burned from the heat and cracks appeared. Because of the installed heat exchanger furnace the heat delivered is not sufficient and drying time is too long with up to 36 hour or even longer.
Further maintenance and repair activities been executed on a very low level from the farmers group. The dryer is now in a bad shape and looks run down.

Meanwhile other rice millers had copied the dryer but increased the flatbed capacity to 8-10tons rice. Unfortunately the less functional parts got also copied and quality worsened at some of the new erected dryers.

To improve the situation the project decided to provide consultancy again to give support to the dryer business for further improvements and changes. From an IRRI consultant information was gathered about dryer developments in Vietnam with improved design. The rice husk furnace is using the direct heat from the flue gas instead of a heat exchanger. Drawings were received about the Vietnamese dryer including the new furnace, improved blower and a testing rig for blower testing and evaluation.

Together with a local workshop a Vietnamese sample blower was built. The blower got installed at a new build sample dryer at a BPTP owned demonstration rice mill at Muliasari village.
A student from Nepal doing his thesis work at the project is evaluating some dryers about the performance, fuel and rice husk consumption, drying time and rice quality. The data should be used as base for further recommendations to rice millers and dryer manufacturers.

To solve some of the problems mentioned above, the consultant's work should deliver certain solutions and should result in following achievements:

- Provide advice to dryer users and producers of dryer to improve performance and capacity and how to maintain
- Include experiences from Vietnam and adapt them to local conditions
- Document recommendations for changes and improvements and supply to workshops and users

Fire pumps production

SSFFMP is also introducing and providing fire fighting equipment to communities and districts in South Sumatra. The equipment must be appropriate, of good quality, and if possible locally produced. Local production contributes to the creation of new job opportunities and employment. Further, additional know how is gained and developed among local production workshops.

Engine driven pumps presents one type of equipment what is also needed for efficient fire fighting. A manufacturer at Bandung Cimahi got chosen for the production of the pumps. Local manufacturers at Palembang were not able to produce. The workshop at Cimahi received a pump sample, sketches, part drawings and other information for production start and for design improvements.

During the manufacturing of a prototype several visits were paid to follow up the process and to give some recommendations at the production process and the making of jigs and fixtures. Additional attention was paid to the making of the moulds for the casting of aluminium parts.

Tests got executed with the pumps at Cimahi and showed satisfying results. Some improvements followed again for quality increase. The power pumps are now ready for field tests during fire fighter training and real forest fire fighting.

The project started to disseminate the locally produced pumps to the provincial forestry department outlets and their specialised forest fire fighting teams.

As the first ordered batch of pumps arrived delayed at the project the decision was made to provide more consultancy to the workshop at Cimahi. The assignment should ensure a smoother production and should solve some still existing problems in production and about quality. The work should contribute to following results and outputs like:

- High pressure forest fire pumps are available in Indonesia
- The local production of pumps is established
- Basic standardisation of the locally produced pumps
- Improved quality and use of pumps established
- High durability and simple maintenance of pumps

2. COMMUNITY DEVELOPMENT; RICE DRYER MAIN TASKS AND ACTIVITIES

2.1 Provide advice to rice dryer users and producers

One of the consultants task was the visit and check of flatbed dryers used by farmers and rice millers. The observation was made that most of the visited dryers are owned by rice millers. Till now the only known dryer in farmer's hand is operated by the farmers group at Upang. But the situation is similar to a commercial rice mill as the group also operates a mill where the dryer is installed.
It got observed by the consultant, that the motivation of the group for operation of mill and dryer is lower compared to the rice millers. It seems commercial millers are more business oriented. Because of their business mind they realized the profit potential in drying rice. That's the main reason for the commercialisation of the dryer in the project area. Another reason presents the shortage of drying space during harvest in wet season. Many paddy get spoilt because of no drying possibility during rainy days or paddy is getting wet several times till dry, resulting in micro cracks and low milling recovery.

Some visits took place to rice mills with installed flatbed dryers to see conditions and to discuss with rice millers. During discussion several issues got mentioned about the dryers, positive and negative.

Following find some:

1. Drying time too long, sometimes up to 36hours or even longer
2. Rice husk stove delivers not the necessary amount of heated air
3. Rice husk stove needs permanent attention and feeding
4. Construction and design of blower needs improvement, often break downs and low air pressure
5. Drying of paddy not equal in the chamber
6. Unload and loading of paddy needs too much time
7. Milling recovery better than with sun drying, additional income from contract drying

Considering the issues mentioned above, following find some explanation and recommendations for improvements and changes:

1. Usually at rice miller's dryers the drying chamber got double sized to 8-10 tons compared to the original sample with only 4 tons capacity. But the blower, diesel engine and husk stove got not increased in size and capacity accordingly. With a low airflow with low pressure and the same heat the drying time extents to the mentioned 36 hours or even longer. Therefore blower, engine and husk stove must be increased accordingly. Further to save diesel fuel most millers operate the engines on low speed close to idle. This is another reason for low air flow, low air pressure and low drying rate.

2. Another reason for low performance presents the size of the used husk furnace. In case capacity of the dryer gets increased to 8-10 ton the size of the stove has also to increase to double husk feet rate. This means not that the size of the stove has also to double; the dimensions may need an increase of about 30-50%.

3. At existing dryers it got observed that the feeding hopper is too small, therefore somebody has always to attend the stove for permanent feeding and removing of ash from the bottom. For the person in charge there is often no time to control the diesel engine or other operations. At the dryer of Pak Haji Daeng Matems, Upang Ceria a sufficient hopper was installed where two bags of husk could be filled in.

There was no need of permanent attention of the stove and the operator could also follow up other activities.

4. The observed blowers were in general of low quality partly with some design mistakes. The first sample blower financed by the project and provided by BPTP at Upang (Farmers group) was a copy from an Agrindo model. The casing looks okay but the fan axle and the block bearings used are too weak. After a while of operation the front bearing broke. The axle got extended and an additional bearing with wooden support stand got fixed. This presents an intermediate solution and is not very lasting. At another place the same problem was observed with the same type of blower. Further at other Agrindo blower copies at some of them the counter blades inside are wrong bended and welded. Instead of supporting the air stream they hamper the flow. It results in insufficient and power consuming operation. To provide better blowers the project ordered the production of a sample blower made according to drawings from Vietnam. To prevent mistakes again the consultant supervised the chosen workshop during manufacturing. The blower was then tested at the BPTP dryer at Muliasari village with good results.

5. At some dryer there were complains about unequal drying of paddy. There are several reasons. One is the unequal distribution in the bed. The layer should be equal. Sometimes the bed is filled with paddy with varying moisture content. Spots with higher moister content have a longer drying time. Another reason presents the length of the bed of sometimes up to 12m. At the air inlet side the pressure is higher then at the other end of the bed. Considering also the low airflow because of the small blower the hot air is not properly reaching the other side of the bed and penetrating the paddy. Sometimes the construction of the screen is also hampering the airflow, specially the wooden beams bearing the screen. In the plenum chamber the distance between wooden beams and ground floor should have at least 30cm.

6. Loading is usually done by carrying the grain bags into the dryer and then emptied on the screen. Six to ten persons are needed to fill an 8 ton dryer in 1-2hours. The most demanding work is to lift the bags over the wall. Wooden ramps, not too steep would be an acceptable solution. Bucket conveyors, belt conveyors or grain augers would be another solution to ease workload and increase speed for filling. But, most dryer owners do not consider such solutions because of the involved costs. Usually emptying is done in the same way as filling, the dry paddy is filled in bags again and then carried by men to the store. The equipment mentioned for filling the bed could be also used for emptying and bagging. Some of the dryers are using 2-3 emptying nozzles fixed at one long side and closed with wooden sliding shutters. This could be helpful for emptying and bagging but will not bring much time saving.

7. Most rice millers using the dryer mentioned a higher milling recovery with less broken kernels and less bran. The student from Nepal did a comparative test about milling recovery. He compared rice from flat bed dryer and from sun drying. There was no significant difference. But the situation will be different when harvest is done during rainy season and paddy is getting wet during sun drying or no sun is there for some days. For the wet season the claim is matching.

The consideration of most of the recommendations give above will not solve the high husk consumption of the stove. The heat exchanger has a low efficiency of heat converting. Even changes in design will not bring significant improvements. Stoves should be used taking direct the hot flue gas from the burning process for heating the air. The agricultural

university at Ho Chi Minh City, Vietnam has developed a model well functioning and successful introduced to the rice mills there.

2.2 Experiences from Vietnam and adaptation to local conditions

The project maintains also contacts to national research institutions as well as international. There are contacts to IRRI (International Rice Research Institute) at the Philippines and to Long Nam University (former University of Agriculture and Forestry) at Ho Chi Minh City, Vietnam. At both institutions intensive research was done regarding flat bed dryers including the blowers and rice husk furnaces.

At IRRI a modernised rice husk furnace was developed using the direct heat of the flue gas instead of a heat exchanger in between. The advantage is a much higher heat yield with much less consumption of rice husk as fuel. It needs only 20-30% of rice husk compared to the old model. There was always the concern that milled rice may smell from burned rice husk, but milling tests proofed the concern was not matching.

The Long Nam University at Ho Chi Minh City also picked up the IRRI design and did further research and development on it. Certain parts of the design got changed to match national supply on materials and to simplify local production.
The blower received also special attention and improvements. Production and design got standardized. The University then invited interested workshops to a manufacturing training on blower and furnace. After proving that they were able to produce good quality blower and furnace the manufactures could start production. The University extension staff visited them at the beginning to make sure only good quality equipment is sold, manufactured according to standard and performing well.

Some further improvements at the dryer got executed, resulting a reversible dryer. Towards the end of the drying process the airflow is changed. Instead from coming from below till the end the airflow is directed from top downward for about 2-3hours. This results in a much more equalized moisture content of the dried paddy.

Via IRRI the SSFFMP project received drawings from the Vietnamese dryer and its components. During the last assignment together with a workshop at Palembang, the consultant started the manufacturing of a sample blower according to Vietnamese standards. The production was strongly supervised to make sure a good quality sample is manufactured. Plenty of advice was given to staff and workshop owner to make sure they understood the crucial parts. The diameter of the blower was 80cm according to drawings.

Later on the workshop manufactured a second type of blower following the same design but with a diameter of about 68cm. Before arrival of the consultant in March 2007 he had also manufactured some rice husk stoves but the heat exchanger type. He had already sold about 5 units including the smaller blower.

One unit got installed at the rice milling centre of BPTP at Muliasari village. The small blower was installed. But the dryer had only a capacity of 4tons paddy.

For testing the dryer and the components like furnace and blowers, the project provided a bigger 80cm blower and a 14HP diesel engine as power source. After visiting the place with an IRRI consultant the recommendation was given to extent the chimney of about 2.5m to lead the smoke over the roof. The chimney hut should also get lifted up to ease the escape of the smoke into air. The improvement got executed before testing.

Later on in April 2007 the Nepalese student tested the dryer including the small and the bigger blower. The drying time was usually 14 -24 hours depending on moisture content of paddy.

First results were:
-Drying time still too long, even with the capacity of only 4 tons
-Furnace not functioning well, feed hopper often clogged, grade too steep, parts falling away from hopper, chimney getting clogged from fly ash
-Both blowers are functioning well and delivering enough air flow
-Diesel consumption of engine rather low

Later on the student tested also other commercial used dryers at rice miller's places. Apart from the low performance of the husk furnaces with heat exchanger, the functioning and performance of the used blowers was usually low and not satisfying. Airflow and pressure were always too low.

The observed habit of operating the diesel engine on low speed should save fuel, but extents the drying time because of low air flow.
If drying time extents to double than expected more diesel fuel is consumed anyhow.
Further with the long drying time the dryer is also occupied often the double time and could not be used for the next charge.

At the dryer of Pak Haji Daeng Matems, Upang Ceria certain changes got already executed to improve efficiency. The air is sucked in parallel along the furnace. At the fire opening side there are openings where the air moves in and goes then through a radial blower instead an axial blower into the plenum chamber. The heat exchanger system still exist, but the air covers a greater area of the exchanger and the heat transfer is stronger.

Additional it could be expected that the heat exchanger got holes inside by overheating. Those holes allow the blower to suck partly flue gasses direct out of the burning chamber. By accident the performance of the furnace increased by using much hotter flue gas from direct burning. This explains partly the increased hot air delivery of the furnace.

The blower is direct coupled with the diesel engine by using a type of tyre coupling. As the engine runs also on low speed the capacity of the blower is not fully exploited. Till now the expert and other project staff could not inspect the radial blower and judge the design.

Considering the pre findings of the dryer testing it could concluded:

-Rice husk furnaces need improvements to increase heat delivery and performance
-A Vietnamese rice husk furnace should be build and tested as an alternative to the used furnace design
-Blower production should follow the Vietnamese sample blower with 80cm diameter. For 8-10tons capacity an increase of size to 90-100cm diameters seem appropriate.
-The smaller ones with 68cm seem sufficient for 4ton capacity dryers

Additional considerations based on visiting some dryer users and manufacturers in Vietnam:

-The commercial used furnaces in Vietnam are all using direct heating without heat exchanger
-The furnaces are usually bigger than the Indonesian models to make sure sufficient heat is produced for a quick drying process

-The blowers having bigger diameters sometimes up to 1.50m, common size is about 1.0 – 1.20m.
-Usually as power source electrical motors are used with 15 – 25 KW
-Some of the rice husk furnaces are feed by conveyors or out of silos to reduce men power needed for operation
-Often other matter than husk is burned additionally like corn cobs, empty grain, waste from paddy cleaning
-Dryers are also used for crop like corn, peanuts, vegetable seeds, soybean and others
-Reversible air flow dryers should also get consideration for quicker drying and more even moisture content of paddy

2.3 Documentation of recommendations for changes and improvements

Rice husk furnace:

-Change from heat exchange type to direct burning Vietnamese type

-Increase size of direct burning furnace by about 1.3-1.5 times. Based on the drawings from the Vietnamese type existing at SSFFMP the extent should be sufficient for 8-10tons capacity. See Annex: 6.4

-Get an increased sample of direct burning furnace manufactured and install at a commercial active rice mill. Do not install at farmer's cooperative rice mills or other low activity place.

-Increase size of feed hopper to reduce attendance time and work load

-Make sure good quality materials are used lasting long enough and sustain long operation time

-Visit manufacturers and give advice

Blower:

-Promote the use of the Vietnamese blower design. See Annex: 6.4

-The blower size of 80cm diameter may be not sufficient for dryers with 8-10tons capacity. Increase size to 90-100cm diameter

-Use as power source a diesel engine with at least 14-20HP

-Use of double V-belt drive to prevent slip and power loss
Pulley size engine 5"B2.
Pulley size blower 4"B2.

-Control and supervise the manufacturing of additional sample blowers

-Convince manufacturers to follow the design and not to tinker around with own non suitable designs

Dryer bed:

-Use of good quality perforated sheet metal as screen

-Make sure dryer base is not getting flooded during rainy season when in use

-Clearance between ground floor and screen wide enough to allow free flow of heated air till the end of the bed and to ensure equal air distribution

-For temperature control, install the thermometer not too close to blower air duct. The feeler should be long enough to tap hot air flow inside the bed

2.4 Summary of achievements (Rice dryer)

- Advice is given to rice dryer users and manufacturers. Users got visited and problems discussed. Some manufacturers of dryers and components got also visited. Problems with components like blowers and furnaces got discussed. Sample improvements on an existing furnace got executed and overseen. Further improvements are still necessary after testing of improved furnaces (heat exchanger type). A change to better design (Vietnamese type) is recommended to make operation of driers commercial more viable.

- A visit to Vietnam with counterparts proofed the need to change certain components at installed dryer design. They got also convinced about the necessary changes (to Vietnamese type) to make the paddy dryer a sustainable development in South Sumatra and other places in Indonesia.

- Recommendations for changes are given and some documents like the improved Vietnamese dryer design are existent at SSFFMP. Involved counterparts and institutions received drawing sets of the Vietnamese dryer including the components like blower, furnace and dryer bed design. A workshop involved in blower and furnace production received also complete drawing sets.

3. FIRE FIGHTING PUMPS; MAIN TASKS AND ACTIVITIES

3.1 Production of second batch of high pressure pumps

Engine driven pumps presents one important type of fire fighting equipment. At SSFFMP several low pressure, medium pressure and high pumps got tested and evaluated. Then the decision was made to manufacture locally a type of pump similar to models produced in USA and Canada.
One reason for the establishment of an own pump production in Indonesia was the high price of imported pump sets. Further the local production should establish local know how and skills. A much cheaper local produced pump would also support and fasten the provision of suitable pumps to Mangalla Agni fire fighting stations (Daops) all over Indonesia.

In 2004 a manufacturer at Bandung Cimahi (CIT Cihanjuang Inti Teknik) got chosen for the production of the high pressure pumps. Local manufacturers at Palembang were not able to produce. The workshop at Cimahi received a pump sample, sketches, part drawings and other information about further possible improvements. During the manufacturing of a prototype several visits were paid to follow up the process and to give some recommendations at the production process. Additional attention was paid to the making of the moulds for the casting of aluminium parts.

During the newest assignment the workshop in Cimahi got visited again for some days. The time was used for provision of further support and advice about the power pump production. The last year ordered first batch of 8 pumps was not complete finalized do to some problems. Five pumps were ready and send over to Palembang. But after testing by project staff some had problems and got rejected.

At the visits attempts were undertaken to repair and to improve the rejected pumps from the first batch. Additional advice was given again to improve the production and to solve related quality problems.

Following some observed problem regarding the pumps:

-Wall thickness not matching of certain aluminium cast parts
-Impurities at casted parts from sand and low quality dirty aluminium alloy
-Rough surface at cast parts
-Tight seat of main mechanical seal, leakage because of less or no axial move
-Eccentricity of main shaft
-Sack holes of screws for cover plate main bearing not properly made
-Twist caps not exchangeable because of small variation in thread diameter and shape
-Difference in size of connecting threads at intake and outlet, small size variation not according to standard
-Hinge at pump base too much play
-Bolt from wing nut rotates, stop washer not properly shaped
-Foldable handle bars at frames are fixed inside and therefore not suitable
-Height and wide of some frames are mixed up

At the remaining 3 pump frames at the work shop, all the hinges at the pump bases had too much play. Additional washers from flat iron got welded there with pass holes. The handle bars got moved to frame outside. The welding of additional corner stiffener was necessary to fix the handles and to keep them able to swivel.

Further the rejected pumps got tested. Problems about the casting, the moulds and other got earthed up as mentioned atop (See: Following some observed problems ….). The newly ordered batch should be free of the problems and therefore solved before production start.

During the visit the contract for a second batch of 8 pumps got signed. The verbal order was already done 4 weeks before. But on arrival at the place the production had not yet started as promised at verbal order time. Main problem mentioned by the workshop owner were about the aluminium casting.

The casting before was subcontracted to a bigger foundry. The place had problems with delivery on time and the quality of the cast was rough and of low standard. Used aluminium alloy was not as expected. Therefore the CIT workshop producing the pumps had decided to do the casting by them selves again.

Together with workshop staff parts of the moulds got changed for improvements. The wall thickness at outlet volute got increased because at some pump bodies cracks and leakage appeared under pressure. The diameter of the main bearing house got increase. This allows the use of thicker set screws for the bearing cover. Sharp corners at the pump casing got removed and round shaped to reduce tensions and cracks when the cast cools down. At the cover plate the wall thickness at bearing seat got also increased to make sure no cracks appear when the small bearing is pressed into the seat.

3.2 Test of second batch of high pressure pumps

At arrival time in Cimahi the production of the second batch of pumps had not yet started do to the problems mentioned at Chapter 3.1 above. The consultant carried 3 of the rejected pumps back to the workshop for improvement and repair. The pumps got opened and the parts checked. Some improvements were immediate executed like the seating of the main mechanical seal. It could not move on the shaft do to tight seat.

The 3 pumps got then tested. One pump showed no leakage and functioned well. One pump had still some leakage and got opened again for check. At the third pump the outlet volute cracked under pressure. A recast of the body is necessary with improved wall thickness.

The experience from the test led to the conclusion that the moulds need change to improve wall thickness and others at the cast as already mentioned at Chapter 3.1.

For the staff at the workshop it got obvious again that proper testing of the pumps presents a crucial step in production. The delivery of the expected quality to the customers presents the most important issue. But this message seems not finally understood by the management of the workshop.

At the report for the assignment in 2006 recommendations were given about quality check and proper testing of the pumps before delivery. This information got handed over to the workshop in 2006.
See Annex: 6.1 Quality criteria for check of Power pump before delivery

3.3 Recommendation for final changes and improvements

At the order of the second batch of pumps the agreement was made, that the manufacturer in Cimahi will only produce the pump heads. Frames, pump bases, drive and assembling with the engine will be made by a workshop in Palembang. The regulation has the advantage that in the case of changes or improvements on frame or drive the workshop could be reached much easier.

Regarding the pump head production the workshop should test the pumps more seriously. (See Annex: 6.1 and 6.2) The pumps should get a stamped in identification number. In case of complains it is much easier to identify.

Further the workshop should use a quality check form. For each pump delivered a quality sheet should be provided where the quality check and the practical test data are noted down. The quality check and test could follow the procedures mentioned at Annex: 6.1.

To promote the high pressure pumps sample sets should be provided to potential users like plantation companies, city fire fighting units and forest fire fighting stations (Daops) for testing and evaluation.

At present pumps are equipped with a 9Hp Honda GX 270 petrol engine. As the prices for the Honda engines increased over the last 3 years, other engine brands could get also used. Present Kawasaki and Yamaha petrol engines are available in the shops on a lower price. The shape of the engines is similar to the Honda type and will fit into the frame. Spare part supply seems ensured for the two brands.

From the first batch of pumps some sets got already supplied to ministry of forestry fire fighting stations. Unfortunately the pumps are not equipped with a hand operated priming pump. The workshop Sentosa in Palembang started with the manufacture of such priming

pump. On further hand out of pump sets the priming pump should get included as it makes priming much easier.

3.4 Summary of achievements (Fire fighting pumps)

- Support and advice was given to the workshop in Cimahi for the production of the second batch of pumps ordered. Because of some still existing and new appeared problems the batch could not be finalized during the time the expert visited and supported the workshop.

- Pumps got tested again at Cimahi. The practical pump test presents the most important step in performance test of each pump head. Recommendations are given how to test and about the quality criteria.

- Recommendations are given about final changes and improvements. Workshop staff got direct advice how to do. Workshop management got advice how to control and to ensure quality.

- For the users guidelines are set up about how to use and maintain the pumps. (See Annex: 6.3)

4. Recommendations

Rice dryers:

To provide a good sample and to direct the development of the dryer technology in the right direction a direct burning rice husk furnace should be built and installed as planned before. As sample the Vietnamese design should be taken but a bit increased in size to deliver enough heat for dryers with 8-10ton capacity.

A bigger blower also increased in size should get manufactured as sample. The diameter could be around 90-100cm.

The direct burning furnace and the blower should be installed at a commercial rice mill at the project area. Other rice millers and metal workshop owners should have easy access to the place for observation and taking measures.

A certain quality control system should get installed to make sure that workshop owners not start again to tinker around with own less functional designs what will spoil again the reputation of the flat bed dryers.

Institutions like BPTP could get involved in the quality control system but staff needs further training on the issue.

Fire pumps:
As already mentioned in the report and already discussed with project staff, the frames for the pumps, pump base, drive and V-belt cover should get manufactured in Palembang. The workshop in Cimahi delivers only the pump heads. With this arrangement it is easier for the project to control and support the finalizing of ordered pump sets. Further more know how is gathered at provincial workshops.

At additional orders the pumps the manufacturer should check it more serious and self dependent. He should use a quality sheet to check each part of the pump and pump performance. Each pump should get a number stamped in for clear identification. A guideline could be the recommendations for the quality and performance check at Annex 6.1. The guidelines could be also used by the workshop in Palembang producing the frame and other components.

To promote the introduction of the pumps, samples should be provided to potential users for testing and evaluation. Potential users could be plantation companies, city fire fighting stations and Mangalla Agni Daops. It should be also considered that there is already the need for Mangalla Agni to reequip Daops with new pumps. At some of the first build stations many pumps are non operational and needs replacement.

5. Final remarks

Rice dryer:

From the project provided machinery and equipment provides the farmer's groups with the possibility to generate additional income for living and to extent the agricultural activities.
The flat bed dryer provided by the project and BPTP got quickly accepted by rice millers and farmers. They immediately realized the advantage of paddy drying specially in rainy season. During operation, the provided model showed some disadvantages and problems. Therefore the project started to look for alternatives. A Vietnamese model presents the best alternative to the present in use. The introduction of the Vietnamese model started with the blower, the rice husk furnace using the direct heat should follow soon as originally planned by the project.

The present used head exchanger furnace presents not the newest technology and should not get promoted further, not even an increased size. More suitable technology like the proofed Vietnamese dryer should be taken and direct introduced, but of course with adaptation to local conditions.

Involved parties in dissemination should realize that the further push of very well functioning technology will be more helpful for farmers and rice millers. The manufacturers should have the chance to produce better models with support from government institutions and the project to fulfill quality expectations from users.

Fire fighting pumps:

During the assignment on industrial extension, work continued to finalize the establishment of power pump production at Bandung Cimahi. The consultant spent many days there to support the workshop in starting the production of the second batch of ordered pumps. Several problems occurred again and got solved. The faced problems proved further a strong support in learning how to manufacture pumps and what could go wrong.

At time of verbal order (March 2007) for the second batch the manufacturer had promised to finish work till end of April 2007. When the consultant arrived in Cimahi the production had not yet started. The rejected pumps from the first batch got tested and repaired. The damage showed that there are still deficiencies in manufacturing skills of staff and lack of management to solve the problems and to coordinate smooth production.

Anyhow efforts are made by staff and management to overcome the obstacles. Like the casting of pump parts is taken back to the workshop for quality improvement and production on time.

Even hampered with some delays and set backs in the case of fire fighting pumps, the experience shows that local workshops are able to produce sophisticated products. The experience proofs further that a strong industrial extension program supports the overall performance of the whole project and secures sustainability and delivers long lasting positive effects, even the project is already long time terminated. The fire fighting pump and the rice dryer introduction has to bee seen as activities embedded in the mentioned context above.

6. Annexes

6.1 Quality criteria for check of Power pump before delivery

6.2 Figure: Test set up for function and performance test power pumps

6.3 Operating manual for four stage fire fighting pump with Honda GX 270 9HP engine

6.4 Pictures: **Ricehusk furnace in operation**
Test of power pump at manufacturers place

6.5 Drawing set Vietnamese rice dryer with blower and furnace