FOSTERING EU-CHINA COOPERATION IN THE DEVELOPMENT OF THE BIOMASS FUELLED HEATING AND COOKING STOVE MARKET IN CHINA

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ABSTRACT: The PR China is facing an increasing demand of all kind of energy. Approximately 70% of the total territory of the PR China is located in areas where the average temperature per day is lower or equal to 5 ^{o}C for a number of 90 days or even up to 211 days per year. Beside of this, three meals per day or about 90% of the food need to be cooked. These facts result in an annual purchase of 130 kg of coal per capita and year for heating and cooking. However, the average efficiency of the available stoves and of the heating units is only 15 to 25% and they do not meet the emission standards used in Europe, thus resulting in high air pollution. Only recently some cities, e.g. Beijing, set limits to the utilisation of high-sulphur coal and the Chinese government is looking for stoves with European standards with reference to combustion efficiency and emission rates. On the other hand at the time being a big amount of biomass as a residue from agriculture and a smaller amount from forestry is available and additional quantities of purpose grown biomass will be available in the future. The aim of this project was to analyse the Chinese biomass cooking and heating stove market, identify European stove technology suitable to the Chinese market conditions, ③ evaluate financial means and expected business, elaborate a common business scheme for technology transfer and/or support the implementation of EU-China joint ventures.

1. PURPOSE OF THE PROGRAMME

The scope of the EU-China Local Authority linking programme, which was supported by the European Commission, was to establish links between EU and Chinese local and regional authorities in order to promote technology transfer, joint ventures, exchange of scientists and technicians in general and in particular in the field of rural-urban development. A series of visits, meetings and workshops in Europe and in China were aiming to create co-operation programmes between local European and Chinese Authorities, politicians, decision makers and entrepreneurs. Because of their potential impact on rural development and relation with the urban environment specific promising sectors of bioenergy sources were to be examined with the support of local authorities, local small-medium enterprises and universities. Institutions in China as e.g. the Ministry of Agriculture of the PR China (MOA), the China Association of Rural Energy Industry (CAREI), the Beijing E&E Biomass Development Co. Ltd. and several universities, and in Europe, as the European Biomass Industry Association (EUBIA), Centrales Agrar Rohstoff Marketing- und Entwicklungs Netzwerk e.V. (CARMEN) and several other partners have been co-operating within the programme. As one of the outcomes of the programme a specific project and co-operation between a Chinese enterprise and a European company resulted, which is presented in the following in more detail.

2. PURPOSE OF THE WORK

Since 1995, EUBIA assisted by ETA, WIP and Energidalen has been working on a co-operation in the

field of bioenergy with the Beijing E&E Biomass Development Co. Ltd., the China Association of Rural Energy Industry and the Chinese Ministry of Agriculture. In the framework of an official visit of a European Commission in Beijing in June 1998 a "Letter of Intent on Small-Scale Low Emission Stoves Co-operation" project was signed. The objectives of this cooperation agreement are: (1) analysis of the Chinese biomass cooking and heating stove market, (2) identification of economically affordable and environmentally sustainable European small scale low emission stoves satisfying the cooking, heating and hot water needs of the Chinese population, (3) evaluation of financial means and expected business, (4) preparation of a durable business co-operation between European and Chinese companies, (5) promotion of know-how and/or technology transfer to China and/or (6) realisation of EU-China joint-venture for the production of heating and cooking stoves in China.

3. RELEVANCE OF THE WORK

Approximately 70% of the total territory of the PR China is located in areas where the average temperature per day is lower or equal to 5 ^{0}C for a number of 90 days or even up to 211 days per year. And around 70% of the Chinese population is living in rural areas and consume approximately 40% of the overall energy supply. Beside of this the dietary habit in China is quite different from that of Europe and traditionally three meals per day or about 90% of the food need to be cooked. According to statistic data of 1995 in frost or cold Northeast, north and Northwest of China the rural buildings mainly rely on small-scale stoves for decentralised heating. Central heating mainly is adopted in cities using heat distribution systems. But city-heating networks can not cover the whole city and, in addition, can not provide hot water without heat exchange units. In Beijing, for example, are approximately 20,000 boilers in the city centre proper used for central heating, and there are another 1 million small-scale household heating stoves scattered in the downtown and on the outskirts of the city centre. These facts result in an annual purchase of 130 kg of coal per capita and year for cooking and heating. Hitherto China has a mainly coal-based energy structure, with a coal consumption amounting to 75% of the total energy consumption. The most used method of direct burning with a very low conversion rate results in high emission rates creating serious pollution. The average efficiency of the available stoves and of the heating units is only 15 to 25% and they do not meet the emission standards used in Europe, thus resulting in a high air pollution. Taking Beijing as an example in the 52 weeks in 1998 the days on which the whole city's pollution index reaches grade 4 (mid pollution) to 5 (heavy pollution) make up 35% of the year. All main air-polluting materials like SO_2, NO_x, TSP and CO have relation to the coal burning and environmental hazards are especially severe during the winter heating period. Only recently some cities, e.g. Beijing and Shenyang in the north-east of China, set limits to the utilisation of high-sulphur coal and the Chinese government is looking for stoves with European standards with reference to combustion efficiency and emission rates. Up to 100 million tons of coal are consumed for heating in cold and frost regions. Despite severe air pollution problems small-scale heating stoves are expected to be mainly fuelled with coal for still a quite long time. Coal for small-scale stoves mainly includes classic crushed coal and shaped briquettes. Because of its improved combustion behaviour shaped briquettes can lower the emission rates of smoke, dust and SO_2 and it is also a fuel-saving fuel. However, for cooking crushed coal is the preferred fuel as it reaches more easily full combustion and high combustion temperature which is wanted for the specific mode of cooking meals. In China large-scale and medium-size but only few small-scale stoves have adopted dust emission control devices for environmental protection, while tens of thousands of small-scale stoves for public use discharge polluting emissions directly into the air whereas 80% of the whole nation's smoke and dust and 90% of SO_2 comes from coal burning.

Mainly in rural areas regrowing fuels like crop straw and maize stalks are an important and traditional fuel energy. They are easy to use. Most are left on the field to dry in the air and sun and then burned directly. However, straw and stalk compaction associated with usage of advanced stove technology represents the development trend of stove fuels and this combination in the mid-term can substitute an appreciable quantity of coal. In 2000 the amount of straw and stalk resources available for energy use in rural areas reached 280 million tons or approximately 120 million tons standard coal equivalent with coal having a lower heating value of approximately 5,000 kcal/kg. This amounts to around 23% of the total rural energy consumption whereas the consumption of straw, stalks and firewood plays a significant role in the rural energy consumption, almost equal to that of coal. However, very often biomass residues like straw and stalks still are burned on the field causing high air pollution and wasted energy. In rural areas the energy requirement for cooking is still covered for a great part with crop stalks and firewood as energy source, resulting in a biomass based energy supply of approx. 45%. Major components of China's strategy for sustainable development include changing present energy generation and consumption patterns, diversifying energy sources and establishing an energy structure that is less or not at all harmful to the environment. Modern, efficient biomass stoves can contribute to achieve sustainable development in China. Stoves serve a range of different purposes: the most common is cooking, but in some areas, particularly where the temperature is low, stoves are also used for space heating. In other areas, separate stoves may be used for heating only. Regarding the high and cold areas in north-east of China, that is Liaolin Province, Jinlin Province, Heilongjiang Province and Inner Mongolia Autonomous Region with a population of 120 million and 30 million households an improvement of energy utilisation is of high interest for the PR of China. According to the statistics from the Ministry of Agriculture in Beijing, the annual market capacity for stoves is 10 million units, of which at the time being only 3 million units are commercially produced. The implementation of high efficient and well adapted modern European stove technology is expected to be one of the important objectives of the EU-China stove-technology co-operation.

4. RESULTS

Low emission, high efficient and high quality stoves with reasonable costs have bright commercial prospects in China. The stove systems under discussion mainly refer to stoves for combined cooking, household heating and hot water provision. Low emission refers that the amount of deleterious flue gas effluents can meet strict environmental protection standards in accordance to European legislation. The fuel should be biomass and/or coal or a mixture of both fuels.

WIP, Muenchen, Germany, and ETA, Florence, Italy, contacted several European companies which are producing such kind of stoves. One company was particularly interested in this project. In the course of a follow-up visit to the mission of the European delegation in China a Chinese delegation paid a visit to Lohberger Heiz- & Kochgeraete Technologie Ges.mbH, Austria, in July 1999. This first contact was followed by a travel of several members of the management group of Lohberger and a member of WIP to China, in order to obtain better understanding of the Chinese market demand and production facilities. In the course of this stay a basic agreement was signed with a large Chinese manufacturing company to co-operate for a future production and commercialisation of Lohberger's combined cooking/ heating units in China. In November/December 1999 a demonstration unit was built at Lohberger and demonstrated to the Chinese partner in January 2000 in the course of a visit of the president and of managers of the Chinese manufacturer in Europe. The demonstration unit highly convinced all delegates. During this meeting the first agreement on a joint venture to produce Lohberger technology stoves in China was formulated, signed by all partners and witnessed by WIP.

During the following months a proposal for an agreement for a co-operative joint venture was drafted on the basis of the respective Chinese law. During a stay of representatives of Lohberger and WIP in China this draft was reviewed and all essential data were included in a "Letter of Intent to establish a co-operative joint venture" whereas this letter of intent is a legal request prior to the formulation and signature of a joint venture contract. This formal letter of intent in May 2000 was signed by both companies and already now the English version of the formal joint venture contract has been signed in China in June 2000. The legal 'Co-operative Joint Venture Contract' to establish commonly the YingKou HUO YAN SHAN Stove Co.,Ltd., was signed by both parties on July 6th, 2000, in Yingkou, the People's Republic of China.

According to the measures of this contract a showroom will be designed by Lohberger and established close to the premises of the Chinese partner. The manufacture of the first product series which is specifically designed for the Chinese market has started already last autumn and was approved finally by the Chinese authorities in spring of this year. Thus a good chance exists to enter the Chinese market at the beginning of this winter season.

The enforced EU-China co-operation coming from this project will bear the following results:

1. When implementing heating and cooking stoves in the Chinese market, which are designed for low emission and high efficiency according to European standards and which are designed to make use of biomass and/or coal or a mixture of both of these fuels the energy consumption structure in China will be restructured.
2. Due to the low emission a significant reduction of pollution and environmental damage will result.
3. The private sector involvement as well in China and in Europe will be encouraged.
4. Very often European manufacturers and Chinese managers are cautious concerning entry into the Chinese market and mainly small-medium enterprises need assistance in preparing for durable and successful business co-operation between European and Chinese companies.
5. Other new European energy technologies, which are clean, cheap and efficient can also be supported and implemented as a follow-up of this successful project.

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