Conditions for sustained household biogas use in rural China

Bettina Bluemling, Wei Qu, Qin Tu

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Problem

- **Promotion of biogas by the Chinese government**
  - "2003 – 2010 National Rural Biogas Construction Plan"
  - 26,5 million household biogas digesters were built in rural China by 2007 (Chen et al. 2010)
  - 60% of the household biogas digesters were working properly (Chen et al. 2010)
  - Why?

Assumptions

"Institutionalization" of maintenance service

- Poor follow-up services and a low comprehension of biogas utilization contribute to low utilization rate (Chen et al. 2010)

- Post-construction maintenance services are not well established after the programme ends.

- Even if new organizations (farmers' associations) or market actors (service companies) are "created" within the programme, they may not sustain after the programme ends.

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Assumption

Migration and household level biogas use

- 120 million internal migrations in China, of which 70% come from rural areas

- During the last 20 years, the proportion of rural population decreased from 73.6% (1990) to 53.4% (2009)

- Diverse opportunities for Non-Agricultural Revenue Generating Activities (NARGAs) in rural China
  - Migration
  - Commuting within county or township
  - Work within the village

Assumption

Migration and household level biogas use

- Foremost young people migrate (Demurger et al. 2010)
- Elder and less educated people stay at home
- Impact of migration has already been proved for
  - the application of water conservation measures (Wachong-Castro et al. 2010)
  - Households' consumption and production decisions (Snyder and Wen 2009)

Assumptions

Migration and household level biogas use

Positive effects on maintenance

- Elder people at home like to use it (↔ firewood collection)
- Interest in time saving through biogas (↔ firewood collection)
- Capital to buy replacement equipment
- Interest in sustaining "modern" lifestyle
- ...

Negative effects on maintenance

- Elder people at home with less capability to deal with technological problems
- Potential to stop animal husbandry
- Biogas not advanced enough (↔ LPG)
- ...

Survey Sample and Methodology

- Survey sample: ~ 1200 households
- Survey location: Guangxi Province, Shandong Province, Gansu Province, Hubei Province
  - 10 counties
  - 34 villages
- Farm household interviews with questions on other household members' basic data

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Dependent Variable
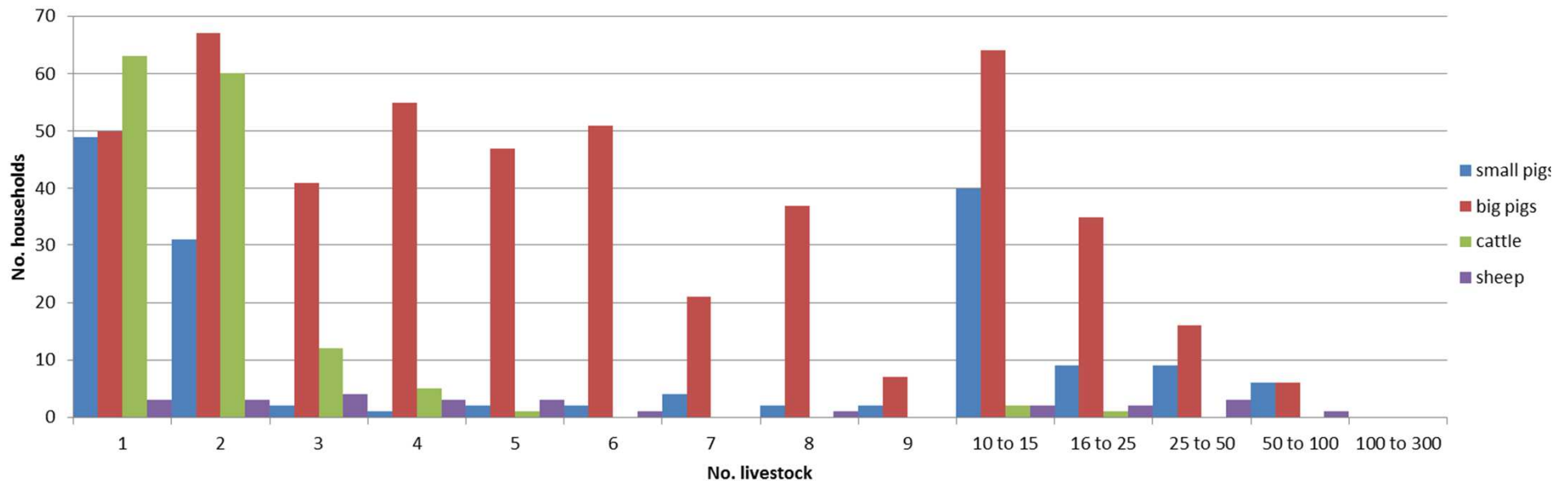
Performance of biogas use and production

- Input to the digester set into relation with the number of household members at home and the number of meals they cook

- Which input?

Dependent Variable

Performance of biogas use and production

Number of farm households with different kinds and amounts of livestock

Dependent Variable

Performance of biogas use and production

- 60% of the sample farm households (i.e. 497 households) keep big pigs

$$\text{Dish(es) per pig} = \frac{\text{No. of hh members at home * meals}}{\text{No. of pigs}}$$

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Independent Variable

1. NARGA location

No. of household members

1. Working in the village
2. Working in the county / township
3. Working in the province

——————————————————————— = Indicator 1

Total household members with

      NARGA

Independent Variable

2. Household composition

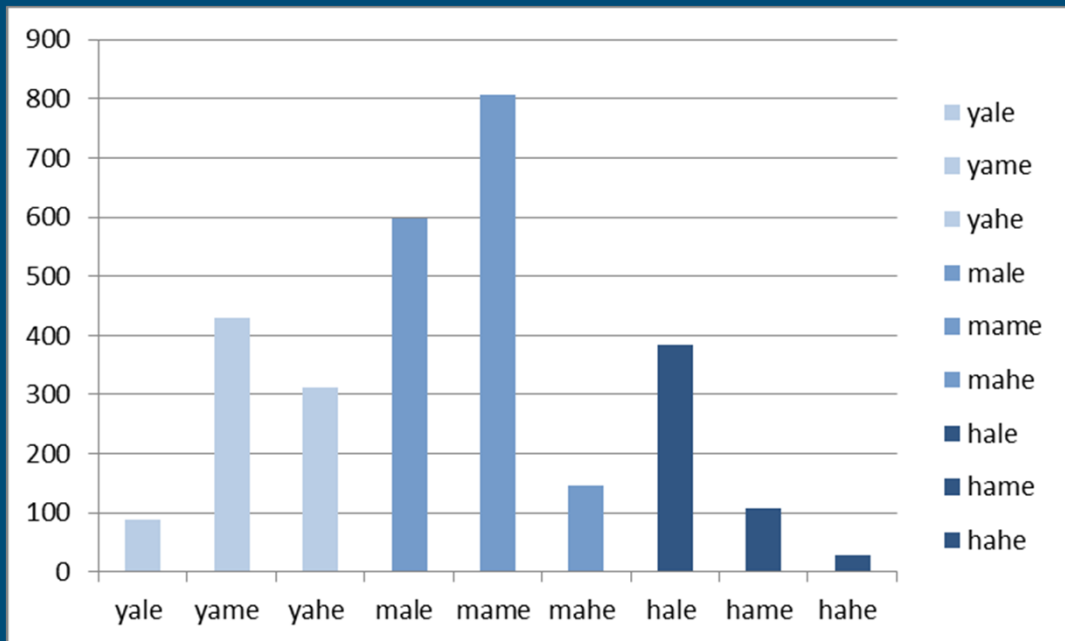|	16 – 35	36 – 55	56 – 65	Household Clusters
6	Yale	male	hale	
9	Yame	mame	hame	
12	Yahe	mahe	hahe	

Clustering returns a sample of 2900 (51%) rural inhabitants who are in the working age and live in the village for more than 9 months

Independent Variable

2. Household composition

43% rural residents who stay in the village are aged from 16 to 55 years and have 9 years of education;

24% of those staying in the village and being aged from 16 to 55 years have a low education level

11% of those in a working age staying in the village are highly educated

Results

1. Linear regression results NARGA location

None of the locations was significant in its impact on the performance indicator

2. Linear regression results hh clusters

male is significant at a 1% level:

if there is 1 additional member with 6 years school education in a household, performance increases for 0.29.

restriction: only 2.35% variance in performance can be explained by the model.

Conclusions

- 43% of the rural working population living in the village are aged from 16 to 55 years and have a low level of education

- Low educated rural residents are less likely to migrate and can be addressees for the further development of biogas
  - Trainings have to be adjusted accordingly

- Migration by young highly educated villagers may not have an impact

- Better indicators

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Thank you!

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