

Constraints to the adoption of nutrient and energy recovery practices and related regulations

- PR China, Lao PDR, Viet Nam, DPR Korea -

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Content

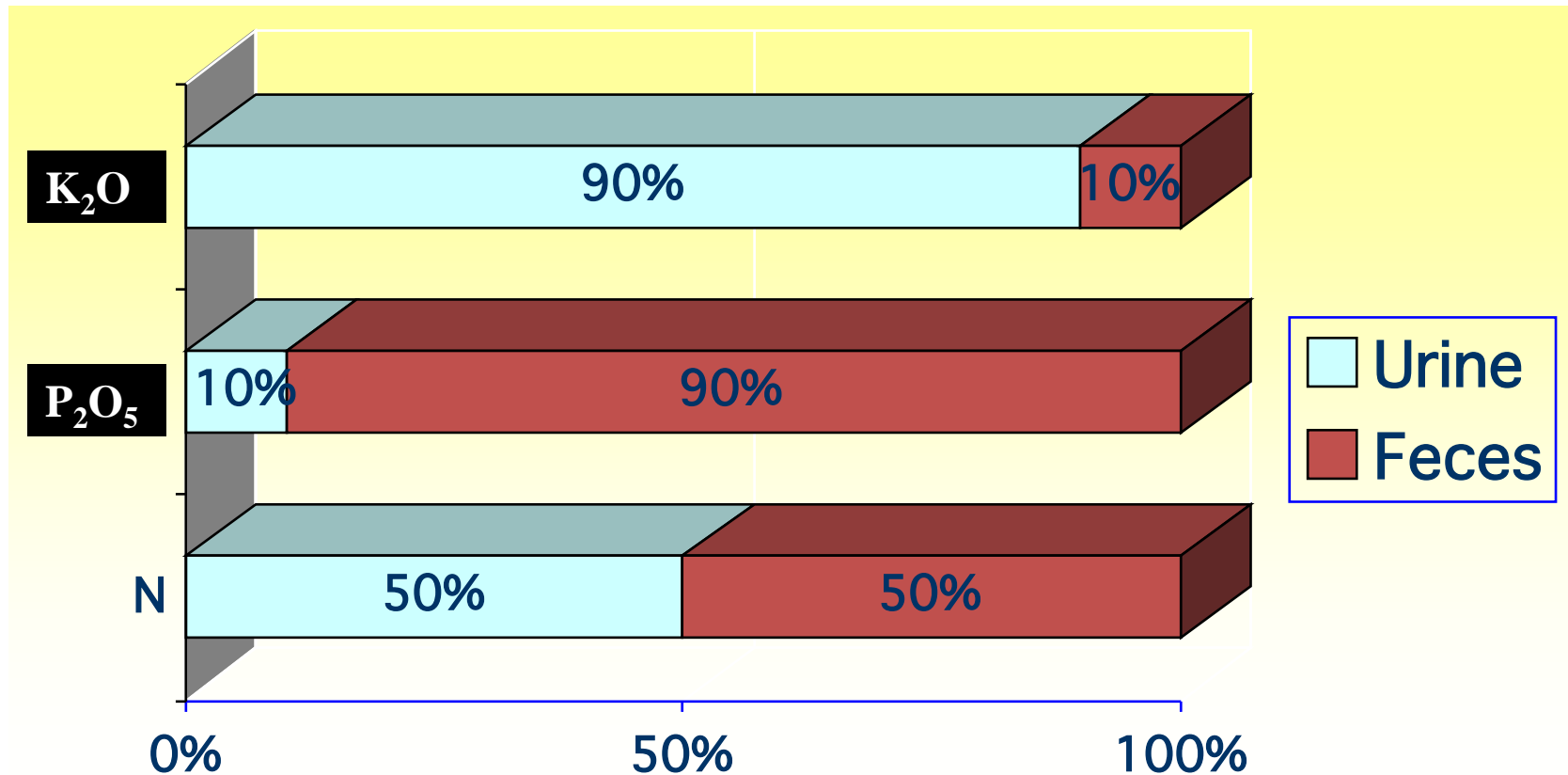
- Basic knowledge in the region
- Practice, Regulations and Constraints in
 - PR China
 - Lao PDR
 - Viet Nam
 - DPRK

Basic knowledge

- Raw manure is used as a fertilizer for thousands of years.
- Dry matter of manure depends on animal husbandry practices.
- Farmers have been defining this manure as a “food” for their crops and also as a source for agro- and household energy.
- The elements in the manure that makes it so valuable are based on N, P, K?

Basic knowledge

Distribution of feeding elements in dairy manure



From H. Tarzizki, 2007 (Ezra Shoshani (Ph.D.), Extension Service, Agricultural & Rural Development Ministry, ISRAEL)

Basic knowledge

Manure separation		
Liquid phase	Composition	Solid phase
95 %	Ammonium	5 %
	5 %	organic Nitrogen 95 %
80 %	Potassium	20 %
	10 %	Methane 90 %

Variable content

50-1 %	Phosphorous*	50-99 %
80-90 %	Volume**	10-20 %

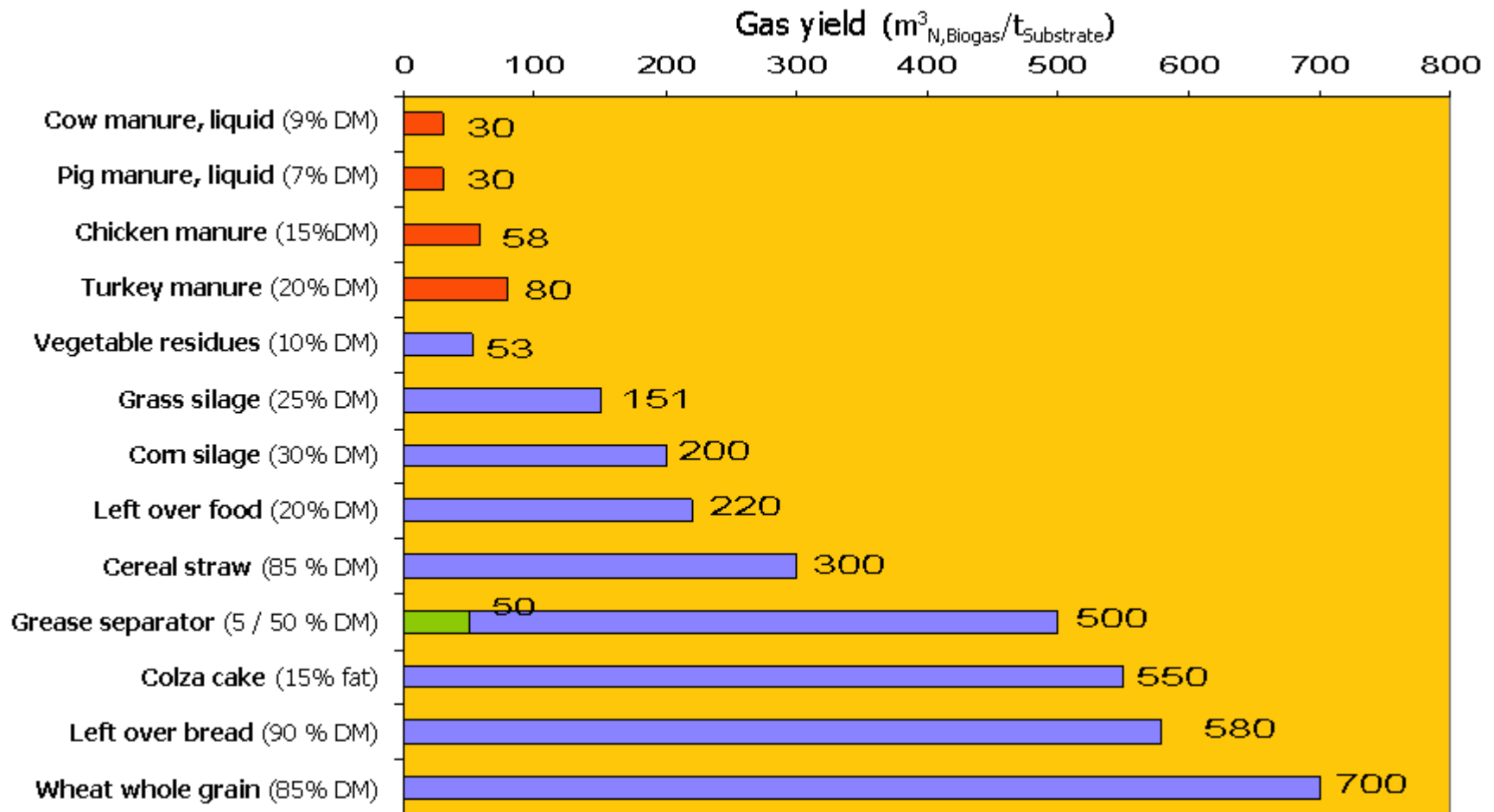
* depending on the application of precipitants

** depending on chosen machinery

Nutrient distribution

Basic knowledge

Biogas yields from different substrates



Basic knowledge

Use of biogas digestate

Digestate can be spread on the fields

- no hygiene restrictions with animal slurry and plant material

Improved Fertilizer

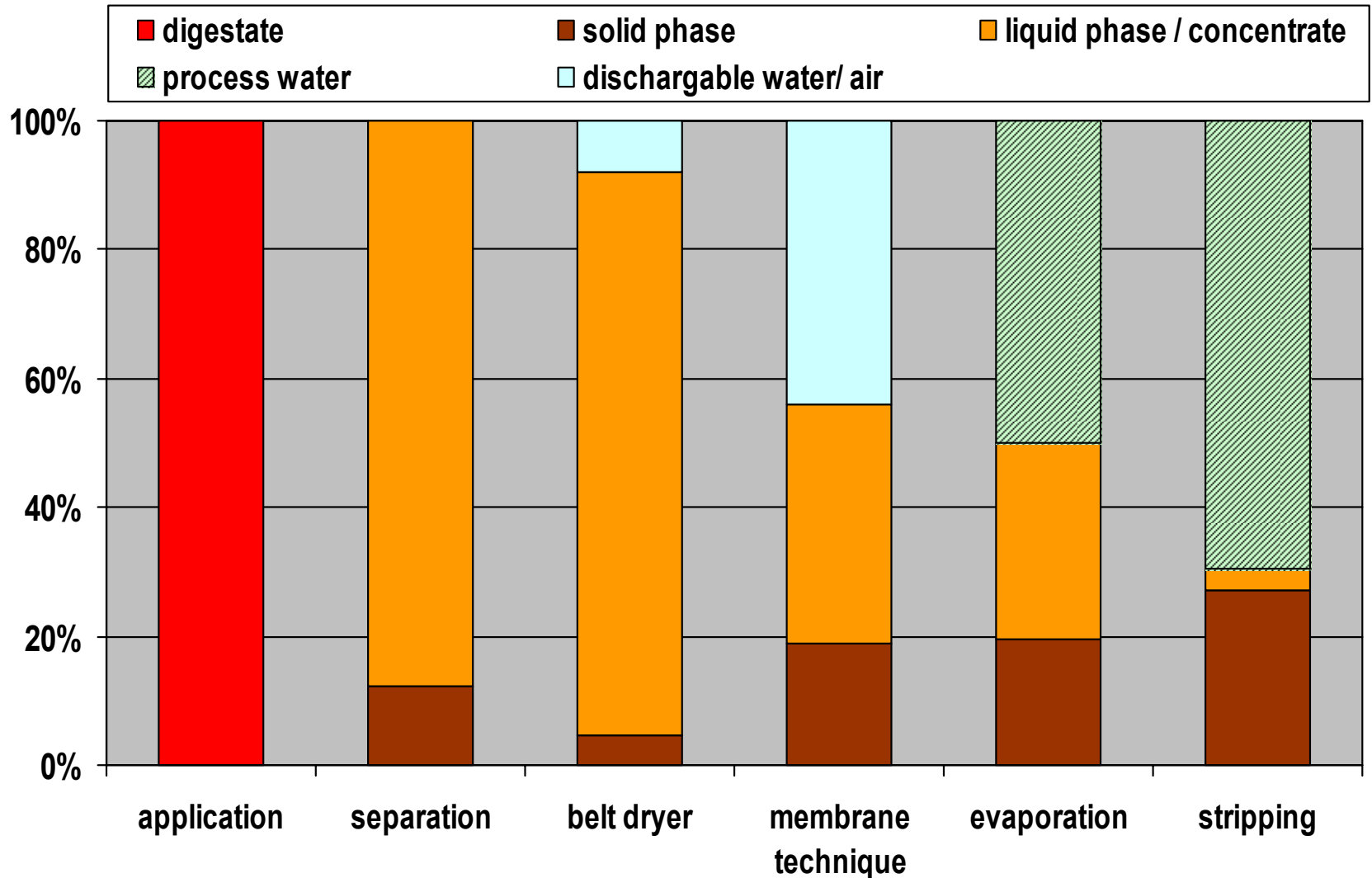
- avoids nutrient losses
- reduces burning effect on plants
- improves flowing properties
- improves plant compatibility
- improves plant health
- reduces germination ability of weed seeds

Environmentally sound

- reduces the intensity of odor
- reduces air pollution through methane and ammonia
- reduces the wash out of nitrate
- sanitizes liquid manure
- recycles organic residues (co-fermentation)
- can avoid connection costs to a central sewer



Basic knowledge



Basic knowledge



Pelletized manure - biogas digestate



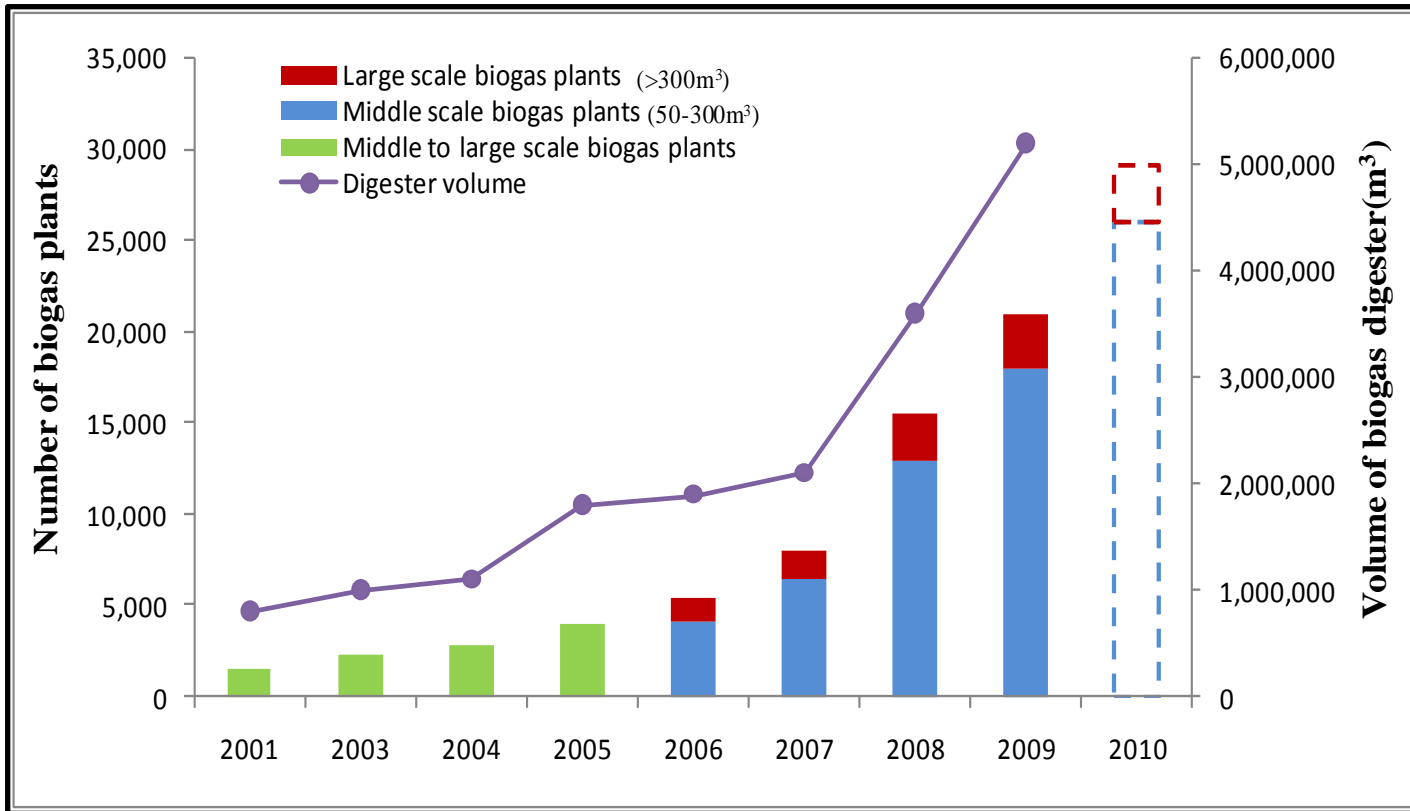
Practices

There are 73032 intensive livestock and poultry breeding farms and biogas projects, with annual biogas production of 1.179 billion cubic meters.





Medium and large scale biogas digester (*centralized facilities*)



Number and volume of medium and large scale biogas digesters installed from 2001 to 2010 in China [Source: China Biogas Association, Biogas Institute of the Ministry of Agriculture (BIOMA), NDRCs “Medium & Long Term Program of the Renewable Energy Development Plan 2006 - 2020”]



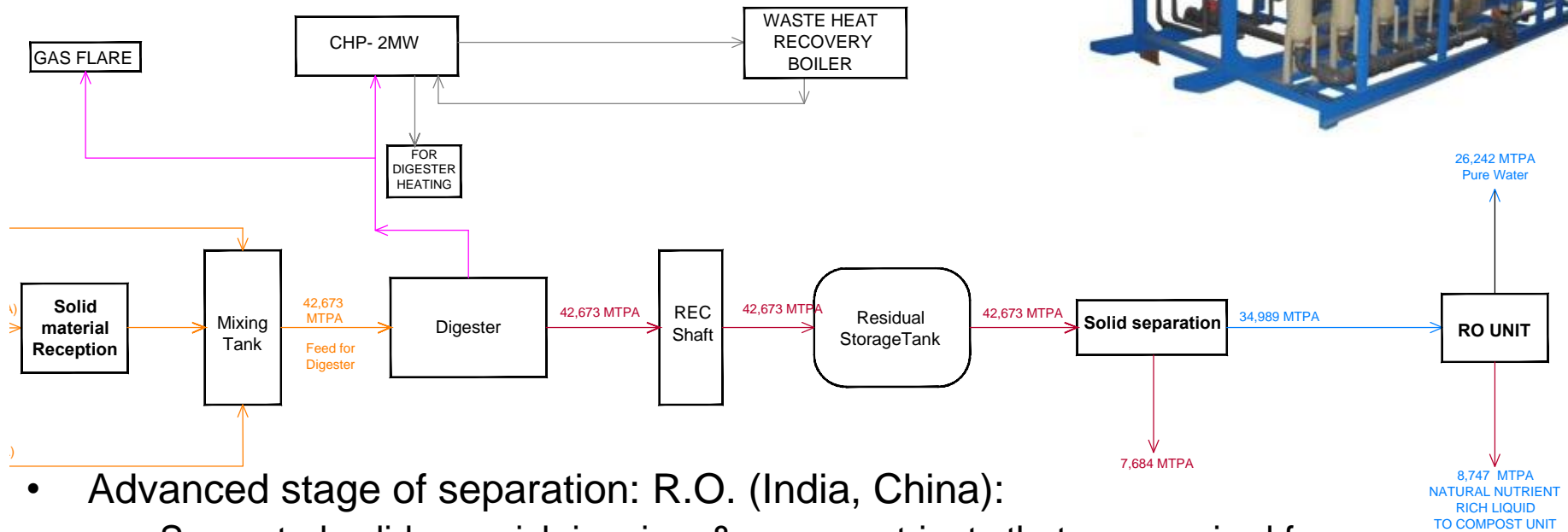
Diversity of fermentation technology: wet fermentation, dry fermentation at ambient temperature and mesophilic fermentation;





Practices

Water balance flow chart of a biogas plant



- Advanced stage of separation: R.O. (India, China):
 - Separated solids are rich in micro & macro nutrients that are required for enrichment of soil.
 - Purified water may be recycled back to the Biogas plant or released and
 - Reject liquid is used as Liquid Fertilizer.



Regulations

- Organic and non-organic fertilizers for increased crop production are the most important safeguards for an sustainable agricultural policy.
- The lack of relevant fertilizer laws, resulting in uncontrolled chemical fertilizer production, distribution, and application, not only harms the interests of farmers, it also undermines the state and business interests.
- There is an urgent need of legislation.*

*2009, November 17: workshop "manure management system and the fertilizer legislation", organized by the China Agricultural University, Central College Fusuo, at Beijing Central Hotel.



Constraints

水冲式清粪 WATER FLUSHING MANURE COLLECTION

每日最少冲洗量 Minimum Water Usage

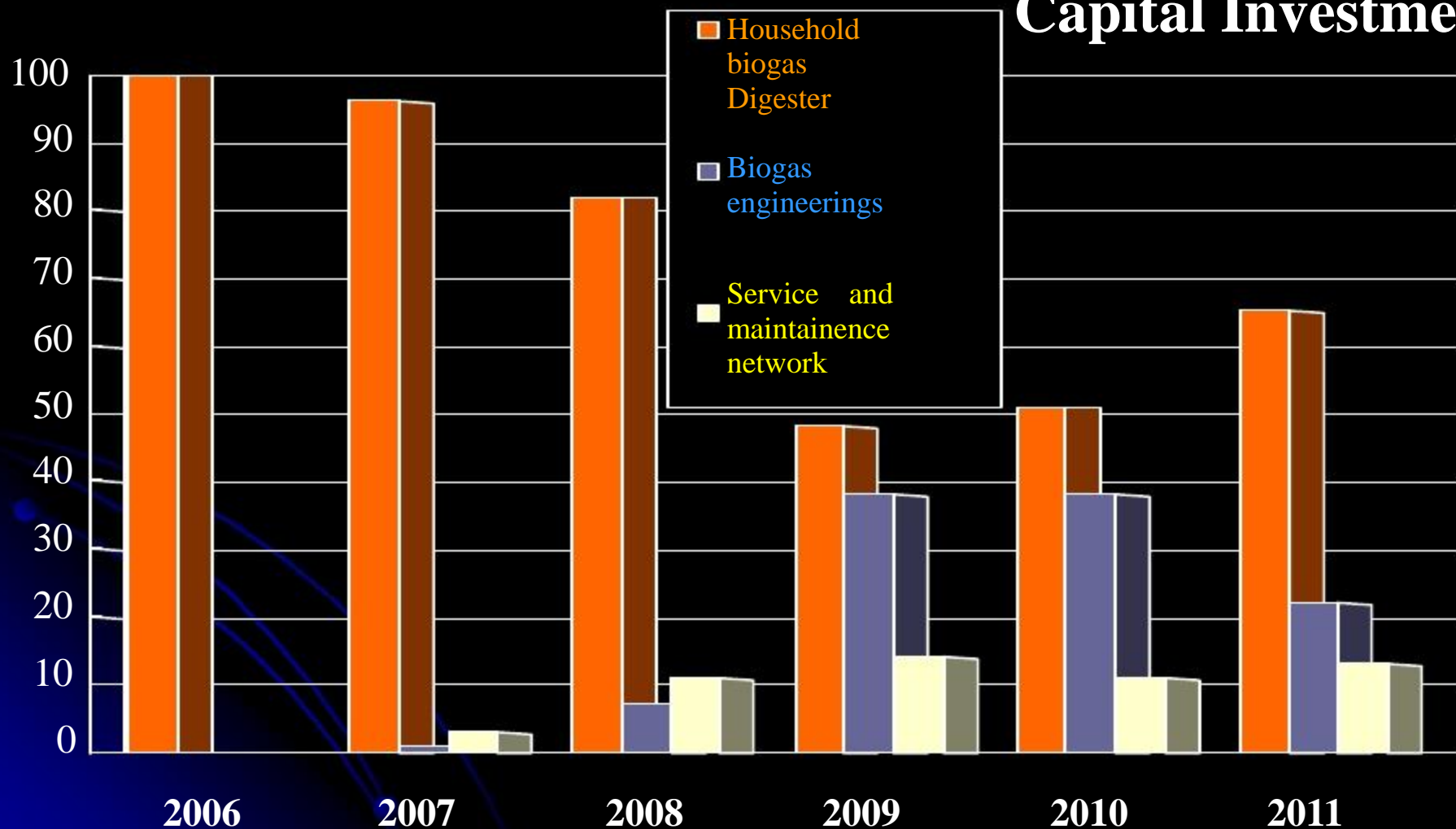
	带仔母猪 Sow	仔猪 Piglets	育肥猪前期 Growing pig	育肥猪后期 Finishing pig	妊娠母猪 Pregnant sow	奶牛与肉牛 Cattle and cow
m ³ /头. 天	0. 133	0. 015	0. 038	0. 057	0. 095	0. 38

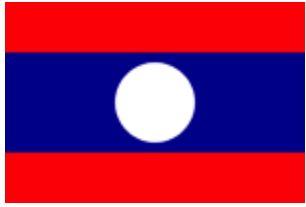


unit: %

Constraints

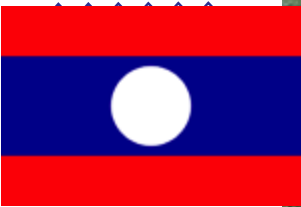
Capital Investment





Practices (1/4)

- Rural families dump charcoal from their stoves into the farmyard manure pits. To improve this product a method has been evolved for creating Biochar Compost, using biochar and animal or human manure.
- Swiss NGO Helvetas has supported over 50 farmer groups to produce biochar from rice husk using locally made gasifiers. The rice husk biochar is mixed with **chicken manure** to grow certified organic vegetables.
- It was testified that biochar could help to retain more moisture and promote better growth especially during the dry season where the vegetable prices are highest.



Locally made gasifier for producing rice husk biochar & wood vinegar



Organic Vegetable



Biochar Mixed with chicken manure

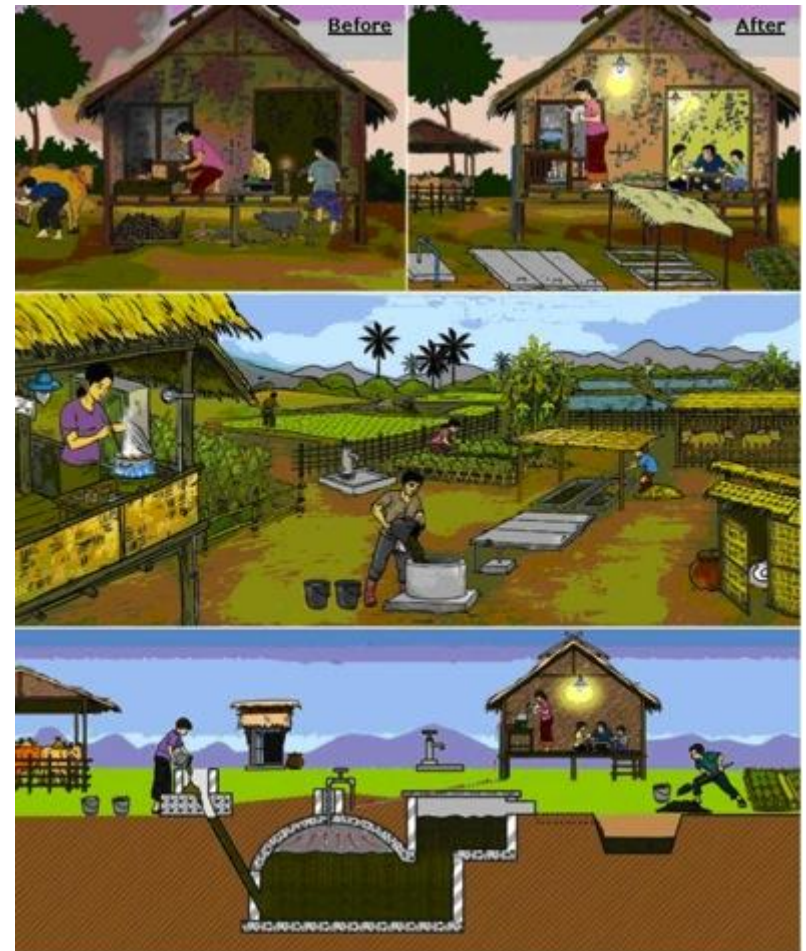


Is this type of closed loop system worth supporting??



Practices (3/4)

- 2500 small scale biogas units (mainly for pig and dairy farmer) have been installed from 2007-2011 in 529 villages of 41 districts of 5 provinces, benefiting 14,855 people (3,323 women).
- The plan until 2020 is to reach out to 10 more provinces accomplishing a target of 50,000 units. This will be scaled up as an integrated livestock program where the bioslurry is utilized as a rich source of urea for food farming.





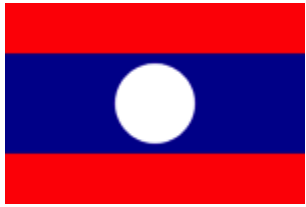
Practices (4/4)

- Recognized that liquid biogas slurry has a higher nutrient content than dried slurry and is a special fertilizer for vegetables and fruits.
- Nutrients in biogas slurry are well balanced for many vegetables; they can be rapidly absorbed and used by plants.
- Demand for slurry by vegetable farmers will be highest in the cool and dry season – at this time many owners of biogas digesters have excess slurry because they are not growing rice.



Regulations (1/2)

- The 2009 recommendations by the Ministry of Agriculture, indicate that livestock (cattle and buffalo) should not be kept at home, but outside the village for reasons of disease prevention.
- *In contrast, there is no similar ruling for pigs even though manure management for pig manure is often non-existent resulting in unhygienic conditions within the village.*



Regulations (2/2)

- Since 2006, the Lao PDR government has consistently expressed a policy commitment to 'Clean Agriculture' which promotes organic agriculture in all types of agro-ecological regions (upland, midstream and lowland).
- A resolution issued by the 8th Party Congress in 2006 states that the Government of Lao PDR has initiated the policy on agriculture production to be secure, sustainable, clean, free of toxic substance and low cost in production.
- The Seventh National Socio-Economic Plan for 2011-15 provides a more general direction with its aims to ensure food security, promote commodity production for domestic use and export, improve productivity and enhance end-product quality as to prepare for entry into the ASEAN common market by 2015.



Constraints

- Efficiency levels of biomass utilization, in particular livestock manure, are generally low, especially when used as cooking fuel.
- Among the GMS countries, Lao PDR has the lowest level of entrepreneurship and needs to instill skills for business (accounting, management, marketing) among struggling entrepreneurs.



Practices (1/4)





Practices (2/4)

- There are approximately 8.5 million small, and 21,000 medium-large scale livestock farms.
- Only approximately 3% of livestock waste is used as organic fertilizer and only 15% is used to produce biogas.



Types of Biogas Projects in Viet Nam

Practices (3/4)

- **By Technology**

- Low cost: mainly to use gas in decentral areas
- Middle cost lagoon plants : for wastewaters with high organic contend and use of own energy content
- Only 3 High-tech-plants: For the optimized production of energy from manure, mainly to sell electricity to the grid

- **Technology**

- Wet fermentation



Practices (4/4)





Regulations (1/2)

- In 2003, the National Strategy for Environment Protection until 2010 and orientation until 2020 was approved by the Prime Minister
 - 100% of new facilities have to apply clean technology or have to be equipped with pollution mitigation equipment, and waste matters have to be treated until they meet environmental regulations;
 - 100% of the urban population and 95% of the rural population have to have access to clean water.
- Decree 21/2008/ND-CP (February 28, 2008) regulates Projects for centralized cattle production and projects for centralized poultry production
- Since July 2008, Biogas program development is considered as an activity which decreases climate change resulting from agriculture, especially due to cattle breeding development in cooperation with industrial development on processing food for cattle and treatment of sewage (Ministry of National Resources and Environment - National Target Programme)



Regulations (2/2)

- In 2010 MARD issued a **Technical Manual for the preparation of environmental impact assessments for animal husbandry projects.**
 - instructions on the content of an environmental impact assessment report and the legal basis of the report
 - developed for centralized livestock production projects.
- **Special legislation for bio-digester effluents is available at sectoral level but not available at national level.**
 - The sectoral standard 10 TCN 678-2006 stipulating regulations on animal waste from livestock farms. Bio-slurry resulting from bio-digestion can be applied as fertilizer on agricultural fields if no over-fertilization results.
 - Regulations for that kind of use should be developed at national level. The bio-digesters' effluents must be taken as highly polluting effluents which need treatment prior to discharge



Constraints (1/2)

- No systematic mechanisms for assessing the costs and benefits of new policies and regulations
- Legislated reforms are often under-funded
- Capacity for legal drafting is weak with lengthy delays in issuing enabling legislation
- Problems in recruiting, retaining, and rewarding high-quality staff
- Food and bio-safety issues are becoming increasingly urgent to address, as agriculture trade increases, trans-boundary animal and human health risks intensify, and domestic consumers' sophistication rises.
- Recent strengthening and modernizing of agriculture research and extension services need further consolidation.
- Agriculture's share of the total State Budget is relatively low in regional terms.



Constraints (2/2)





Practices

- In 2005, DPRK had 600,000 cattle (a very few dairy cows, with most of the rest classified as “Oxen”), 3.2 million pigs, 21 million chickens, 5.5 million ducks (*FAO statistics*).
- DPRK’s current resource of biomass in livestock manure is about 1 million tons per year.
- Conservation Agriculture is not applied.



Cooperative farms









Architectural cross-section drawing of a roof structure. The drawing shows a gabled roof supported by two columns. The roof slope is indicated by a triangle with a vertical side of 10 and a horizontal side of 5. The roof is labeled '상세' (Detail) and '유리' (Glass) with dimensions 'φ=5' and '1=1000'. The columns are labeled '콘크리트기둥' (Concrete Column) with dimensions '200x200' and '200'. The roof structure includes '소판' (Plywood) and '방수지' (Waterproofing). A circular inset shows a detail of the '고정철물' (Fixed Hardware) and '상세' (Detail). The drawing includes elevation markers: +3520, +3000, ±0.00, and -150. A table on the left lists materials and dimensions: 세로미장 20, 경량크리트 40, 세로미장 20, 방수지 3겹, 소판 80, 석회질 세로미장 20, 보온재 60, 불록 290, 세로미장 20, 외장재.







Use of effluent for vegetables





Constraints

- Still only very few biogas systems in rural areas.
- Insulating the biogas plant and placing the "digester" in a greenhouse increases efficiency.
- The greenhouse also allows the family to extend the growing seasons of food within the greenhouse and keep animals warm during the winter months.

Summary: Development of Biogas in Asia



High-Tech

Aim: Efficient electricity generation and feed-in to the grid

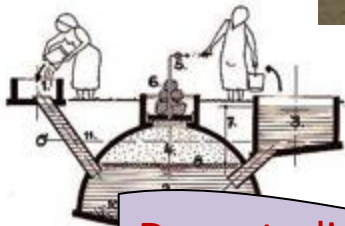
Countries: China, Philippines, Pakistan ...



Middle-Tech

Aim: Reduction of pollution / CDM and electricity production for decentralized use

Countries: China, Thailand, India, Viet Nam, RO Korea, Lao PDR



Decentralized Household-plants

Aim: cooking / lighting / household electricity

Countries: Nepal, India, China, Cambodia, Lao PDR, Viet Nam, DPR Korea, Bangladesh ..

Increasing development / economic growth in countries and regions →

Treatment targets & technology set-up

- must be adopted to the feedstock and local re-use situation
- Which should be the targets in your situation?

Biogas plant based on Energy-Agro-ecological principles

- the slurry and sludge after the anaerobic process are required to be absorbed by farmland as fertilizer and soil improver, or for ferti-irrigation;
- there must be enough farmland nearby.

Biogas plant based on Energy- Environment principles

- the effluent after post-treatment should reach the national standard before discharged into water bodies.
- there should be a water body near by.

Thanks

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