2016

Workshop Report: International Workshop on Sustainability and Resilience of Bioenergy for Climate Change in Bali and East Java: Scoping and Envisioning

Abbreviation List

BNI	Bank Negara Indonesia
CoE	Centre of excellence
CO_2	Carbon dioxide
FiT	Feed-in Tariff
GHG	Green House Gases
HIVOS	International Humanist Institute for Cooperation with Developing Countries
IDR	Indonesia Rupiah
ICCTF	Indonesia Climate Change Trust Fund
IPP	Independent Power Producer
LPG	Liquefied Petroleum Gas
MEMR	Ministry of Energy and Mineral Resources
BAPPENAS	Ministry of National Development Planning
NGOs	Non-Governmental Organizations
PPA	Programme Partnership Arrangements
PT PLN	PT Perusahaan Listrik Negara/State Electricity Company
PT. Pertamina	Mining Oil and Natural Gas State ompany
PT. RNI	PT. Rajawali Nusantara Indonesia
su-re.co	PT. Sustainability and Resilience Co
PTSEIK	Energy Resource Technology Center and the Chemical Industry
SEI	Stockholm Environment Institute
WWF	World Wide Fund
YRE	Yayasan Rumah Energi/Energy House Foundation

Workshop Report

Executive summary

This report is the result of a three-day workshop in Bali, Indonesia. The main objective of the workshop was to bring participants from many backgrounds and sectors together in order to discuss the potential of several forms of bioenergy in Indonesia and pathways of their developments. Moreover, participants explored risks but also opportunities of these pathways as well as potential co-benefits such as sustainable economic growth. The workshop was organised by Udayana University, Stockholm Environment Institute (SEI) and PT. Sustainability and Resilience Co (su-re.co) within the framework of two research projects funded by the European Commission: GreenWin and TRANSrisk. The event furthermore benefited from the generous support of the Indonesia Climate Change Trust Fund (ICCTF) on behalf of Ministry of National Development Planning (BAPPENAS).

The first day of the workshop allowed for a field trip to the village of Tukadaya in the Jembrana regency of West-Bali. There, participants were given the opportunity to see and discuss successful pilot bioenergy projects i.e. cooking stoves using wood pellets and digesters processing animal waste into biogas for the village community. This allowed them to gain valuable insights on how rural communities could benefit from bioenergy developments and to deliver a solid base for fruitful discussions that took place the following two days.

The second day began with a variety of presentations from the research community in Indonesia, governmental officials and locals as well as international experts on bioenergy in order to supplement the first hand experiences of the first day field trip with some insights from other countries and policy developments in Indonesia itself. Later on that day, participants were split into four groups and discussed their vision of bioenergy development in East Java and Bali, how they could contribute to governmental policies of reducing GHG emissions and associated risks and opportunities. Furthermore, the groups were invited to discuss what kind of feedstocks were deemed particularly beneficial for exploitation in order to increase bioenergy uptake in Indonesia.
The exercises on the third day were built on the fruitful discussions and findings from day two and invited the participants to analyse the value chains for certain feedstock and to identify issues along the value chain which could hinder a successful bioenergy development. Again, four groups were formed according to the participants' backgrounds and knowledge. The value chains discussed during this session were wood pellets, biogas and bioethanol from rice straw, rice husks and other agricultural and household residues.

The workshop was well attended with more than 68 registered participants coming from backgrounds such as local and national government, private sector, Non-Governmental Organizations (NGOs), academia, science and international experts. The workshop agenda, documentations and workshop presentations are available at:

https://groups/fellowshipsustainabilityandresilienceofbioenergyforclimatechang

Day 1 – Field Visit

On day 1 of the workshop, the participants experienced live demonstration of wood pellets and biogas utilisation during a field visit to Tukadaya village, Jembrana regency. It took place specifically at Brawantangi, a sub-village that uses biomass stoves and Kembangsari, a sub village using the biogas for cooking and lighting. During the field visit, the village community showed their enthusiasm towards the bioenergy project as evidenced by the significant number of participants who came with many questions during the field visit.

Figure 1. Field visit: Making banana fried using wood pellet stoves

The Forestry Department of Jembrana reported that biogas utilisation is one of the national (strategies) to reduce emissions from the agriculture sector. In Bali, one of the programmes is the Bali Clean Energy programme, where integrated farming is one part The Bali government is keen on biogas developments due to the availability of manure from cows and pigs.

In 2015, it was reported that 134 biogas units have been installed in Jembrana. The type of biogas reactors installed in Jembrana include fixed dome and floating dome.

In Bali, the government commenced an integrated farming programme consisting of approximately 1000 biogas units, however, many do not function properly. In the integrated farming programme that also constitute biogas production programme, the government gives the community 20 cows for farming

purposes. Training is provided by the government but not in a continuous manner. This lack of continuous training in maintenance is one of the reasons why biogas developments stall in the province. Other reasons are the lack of technical knowledge, the lack of economic and financial support, and difficulty in handling the installations. Nonetheless, Bali has great potential for biogas development but the sustainability aspect should always be considered.

In terms of the utilisation, biogas is consumed for cooking in Jembrana, but the government also wants to use it for generating electricity. Usually, a $7m^3$ biogas installation, yields enough gas for a week of cooking.
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Besides the government, local and international NGOS also promote biogas uptake. For instance, local NGO Yayasan Rumah Energi (YRE) builds biogas digesters in Indonesia together with the international NGO HIVOS, usually makes of fixed dome designs. . Biogas has been established since 1970s in Indonesia. However, the growth of biogas development is not significant, therefore a new approach is established where a biogas plant is granted to the community that needs it. YRE then asks the government to reduce the subsidy for community hence the community have to pay for the biogas.

Figure 2. Participants introduce themselves and voice their expectations and contributions.

Another biomass project is the use of wood pellets in cook stoves. There are 20 selected households which are chosen by a participatory process. There are two types of biomass stoves: stoves with blower (7 ounce wood pellets/1 hour cooking) and stoves without blower (1 kg wood pellets/1.5 hour cooking). People prefer stoves without blower because it produces less smoke during cooking, hence safer. Normally, 2 kg of wood pellets are consumed per day for cooking. Users normally can afford to pay IDR150,000-200,000 including purchase of the stoves. Currently, both the stove and wood pellets are subsidised. If the subsidy for wood pellets is removed, villagers indicated that they would be willing to pay IDR1500/kg wood pellets. In addition, the residues from wood pellets can be used as fertiliser.

Figure 3. Discussion beyond workshop to build networking

Day 2 – Introduction

Day 2 started with an opening speech by project leader Prof. Takeshi Takama during which he highlighted Indonesia's potential for contribution to mitigate climate change through bioenergy usage at the local and national level, and introduced the research projects GreenWIN and TRANSrisk as well as the planned agenda of the workshop.

The floor was then handed to the vice rector of Udayana University, Prof. I Made Suastra who highlighted the opportunity such research projects represent for his university, all the more so given the fact Udayana university has recently been chosen to host a centre of excellence (CoE) on clean energy in Bali. He emphasised on the huge potential of such workshops for discussing potential bioenergy pathways as one of the targeted clean energies. The CoE purpose is to enable concerted effort in developing and deploying new and renewable energy, to assist in the transfer and deployment of technologies through innovative financinal and business models, and also to provide a collaborative learning and training environment of new and renewable energy.

Next, a presentation by Ms. Syamsidar Thamrin of the Indonesian Ministry of National Development (BAPPENAS) elaborated on the energy and climate policies of the Indonesian government and on the country's energy landscape. The new government was keen to keep its climate change mitigation

ambitions but a lot of upscaling would be needed in order to exploit Indonesia's huge bioenergy potential well. In addition, overcoming some issues such as technology transfer would be a challenge.

Figure 4. Keepsakes from vice rector Udayana University to ICCTF and TRANSrisk

In the next set of presentations, national and international researches and experts then took the opportunity to present to workshop participants with some of the work which has already started or will be done in the framework of the two European Commission funded research projects GreenWin and TRANSrisk.

Figure 5. Activities during 1st day of workshop

Prof. Louis Lemkow Zetterling from the Autonomous University of Barcelona elaborated on the fact on how some work packages within GreenWin advanced the understanding of poverty reduction and resilient livelihoods by means of sustainable development and gave some illustrative examples from architectural developments in his own university. Ibnu Budiman, researcher /at PT. Sustainability and Resilience Co. then presented some findings of field work done in the Jembrana, West Bali where barriers to bioenergy uptake had been discussed with local farming communities. The first session of the day was then closed by Ms. Anne Nyambane, research fellow at SEI and ESPA, who spoke about charcoal usage in Kenya and Mr. Stefan Bößner, research fellow at SEI, who elaborated on the energy and climate change policy framework in Indonesia and the challenges that await Indonesia on a transition towards more sustainability, challenges that are indeed global in nature.

After those initial presentations, the workshop went into its participatory phase. Four groups were formed by letting the participants choose their groups freely and participants were invited to discuss Indonesian climate and energy policy targets.

Discussion 1: Visions for Bali and East Java (H-Form exercise)

Exercise structure: Four groups (A, B, C, D) were formed based on where participants chose to sit in the room (no specific guidance on group composition). Each group discussed the following question:

> *"What do you think about the government's target to increase bioenergy and to reduce emissions? Can it be achieved?"*

Subsequently, the participants rated this question from 0 (most likely to be missed) to 10 (sure to be achieved) and discussed **risks** and **opportunities** arising from the target based on the following question:

> *"What does this mean for you and for your work? Does it present opportunities or risks? Why?"*

The following tables present the written results of the discussions.

Group A – SCORE: 4.9 (ranging from 1-7 individually)

Members score for the efficiency of government programmes toward government target on RE and climate change;

- Erwin ICCTF (7)
- Thailand student in Udayana (3)
- Doddy, Bappenas (6)
- Sigit, MEMR/ESDM (7)
- David, Lawyer (1)
- Anne Nyambane, SEI Africa (3)
- Ibnu, Udayana
- Florian, business school student (5)
- Louis, UAB (4.5)
- Francais (6)

Table 1. H-form: Risk and opportunities for bioenergy development according to Group A

Risks	Comment	Opportunities	Comment
Government commitment to support	Unstable political power in the government affects the policy consistency	**Distribute generation via small scale projects**	It can scale up the projects
Sustainability of target	Understanding of translating target into programmes	**Global support on green growth**	Funding security
Continuing corruption with large scale bioenergy	It reduces amount of funding which is already small	**Natural resource availability** **Political mainstream on green energy**	Political will
Top down approach; stakeholder participation **Lack of community participation** **Lack of understanding community processes**	Top down approach is considered insufficient. This can be caused by lack of knowledge and gap of communication among governments (ministries, central and local governments) and between governments and local communities	**Decentralised of potential power to provinces and local created bioenergy opportunities**	The local government knows their community needs and situation better
Database for bioenergy potential: some regions, data is not accurate, that becomes a problem for development	It affects research quality	**Significant sources of bioenergy feedstocks**	This refers to the resources for feedstock
Targets have not been met in past for bioethanol > makes actors sceptical that it will happen this time > they don't try	Need more incentives for the actors	**Taking into account socio-economic variables in determining targets**	Community approach has to be suitable with local context
Booming of initiatives whose impacts are not well understood > unsustainable	Project with business-oriented	**Developing not only bioenergy installation but integrated bioenergy instrument; example: energy /forest planting for energy, use, by using unused/degraded land**	Collaboration with other energy/ environment/ agriculture programmes

Risks	Comment	Opportunities	Comment
Risk: price is expensive	Subsidy is needed	**Mentality change**	Insufficient knowledge regarding bio-energy may decrease the acceptance of bio-energy utilisation, for example, collecting the waste
Decentralisation system	The perceived risk was that when energy systems are managed at the local level, there might be insufficient knowledge/ funding to do so	**Government support in terms of policies, feasibility studies, finance and ensuring such initiatives enhance well-being of poor**	Full support is needed from closest stakeholder which is local government
Financial crisis freeing investment funds	Enabling regulation is needed to secure the investment	**Additional funding for achieving GHG emissions reductions**	Private sector involvement is needed
		So called "disruptive" technologies both for generation and information sharing	Technology diffusion

Discussion of results:

Stakeholders in this group emphasised the need for many stakeholders to be involved, rather than having a top down approach by the government. Group members noted that the energy ministry has tried to work with many sectors/agencies/ministries to apply the programmes, and despite the difficulties, they are persevering with the programmes. The difficulties may be caused by the gap in communication and lack of knowledge among all stakeholders (ministries, central government, local government, NGOs, local communities).

Implementation of bioenergy projects are promoted by government but sometimes correlation between bioenergy with GHG emission reduction is not explained further. Therefore, it needs to be explained clearly. For example, the target of bio-energy utilisation has been set by the Government of Indonesia (25% by 2025), based on business plan of electricity supply reported by PT PLN (State Electricity Company), the contribution of biomass is still less than 1% in 2024. This shows insufficient commitment from the government. This also correlates with the sustainability of the target. This situation may also be influenced by corruption cases causing a significant failure to bioenergy projects, for example diversion of fund by the beneficiary of the project.

Group B – SCORE: 4.3

Members:

- Anna Carlsson – Intern, su-re.co
- Robert de Groot, HIVOS
- Lina Moeis, Yayasan Rumah Energi
- Ippah, Udayana University
- Andianto Hidayat, PT. Pertamina
- Indra Wirawan, Bali Turtle Island Development
- Ida Ayu Giriantari, Udayana University
- Satya Kumara, Udayana University
- Guntur, Senior Forestry Departement Staff, Jembrana Regency
- Ni Komang Widiani, ICCTF

Table 2. H-form: Risk and opportunities for bioenergy development according to Group B

Risks	Comment	Opportunities	Comment
Resource limitation		**Create better awareness on CC**	
Limited investor interest		**To improve quality of projects**	
Mismatch/disconnecting policies among policy makers		**To develop bioenergy market the electricity selling price should be attractive for investors**	
Failing government tender system		**Create business opportunity for land owner, plantation forest company to produce bioenergy purpose crops**	
Low quality of technologies implemented, which are not sustainable	Ministry of finance focus on most effective strategy. Emphasis on low price leads to low quality ("How much for the lowest price?"). "Market destroyer": supplier with low price and low quality creates disadvantages for supplier with high price	**Opportunity for developer to convert potential feedstock into usable type of energy (fuel or power)**	

Risks	Comment	Opportunities	Comment
	and high quality. As such, many examples of projects have failed because of low price. The more failures, the less trust from people. Government fail to address to socioeconomic aspects of renewable energy.		
Limited business development support		**Big potential, cooperation with NGO**	
Unproven upscaling plan		**Policy, government targeted to use 20% bioenergy in 2020.**	
Political change		**Increase price of fuel**	
Destroy market		**Regulatory FiT**	
Willingness of consumers to pay the full economical price of biomass energy without subsidies			
Low good governance			

Discussion of results:

Much of the discussion by group B was about the failure by government policies. A suggestion was raised to look for other sectors such as private investors and banks instead of expecting support from the government only.

The group recognised that we could not blame the government solely for failure of policies (though there have been some) because the government has already taken a positive initiative by making regulations such as FiT (Feed-in Tariff).

Group members noted that it is not about blaming government but as a reminder to them to do something right and better in future. As we can see that the government of Indonesia has a lot of problems so they cannot focus on only one issue. We are still hoping that the governance will introduce the right regulation in future. When talking about FiTs, it is of course a positive step but its implementation is hampered by many incongruences between regulations and in the end, no one would take the responsibility. Hence, a recommendation to the government is to make the best decision in policies.

The group also noted that it is very important to educate everyone towards understanding how renewable energy can support target achievement.

Barrier of supply: if government subsidises bioenergy technology suppliers, suppliers will tend to wait for subsidies opportunities rather than pursue a market based approach where consumers pay the full cost of the technology. One big company supported by government can destroy the market for biogas if the government is focus on subsidies as they will not value the quality. The Ministry of finance should focus on the most cost effective strategy because an emphasis on low prices leads to low quality ("How much for the lowest price?"). Also, the role and impact of a "Market destroyer" was discussed: A supplier with low price and low quality creates disadvantages for suppliers with high price and high quality if only the cheapest price is sought. As such, many examples of projects have failed because of low price. The more failures, the less trust from people. Government failed to address to socioeconomic aspects of renewable energy.

Another Policy barrier discussed was how to get the Programme Partnership Arrangements (PPA). Prof. Satya (Udayana) expressed optimism and noted the importance of international funding to assess projects and their potential as the government lacks the ability to assess and evaluate properly. In addition, international agencies are important, in order to increase awareness about renewable energy and cases of Indonesia.

Potential solution: The Government struggles with successful projects – they are often too up-scaled and they lack linkage to provincial governments – This is why, the private sector could play an important role, to fill the gap between central and provincial government.

Group C – SCORE:	**4**

Members:

- Prima Amelia, Interpreter
- Auditya Sari, su-re.co
- Orin, Udayana Magister Student
- I Made Utama, head of Tukadaya village
- Sayu Putu Luwih, wood pellet stove user
- Sayu Kadek Puspawati, wood pellet stove user
- I Putu Anom Darmadi, head of Brawantangi, Tudakaya sub village
- I Putu Winastra, head of Sari Kuning, Tukadaya sub village
- I Made Wastra, head of Pangkung Jajang, Tukadaya sub village
- Dewa Gede, Yayasan Rumah Energi

Table 3. H-form: Risk and opportunities for bioenergy development according to Group C

Risks	Comment	Opportunities	Comment
Smoke increasing from wood pellets burn	Compare to the LPG usage, wood pellets still produce smoke. They imagine if all the households using wood pellet stove, it will increase the smoke.	**Support Wood Pellets**	Wood pellets identified by the group as the most promising feedstock. More information in "Discussion" below.
Support from society is low	This is a kind of social acceptance and the low environmental awareness		
Teamwork national & local government	It hard to find the match policy between local and national government related to bioenergy. Sometimes it is very political too.	**Cooperation with private sector**	To establish the cooperation between the locals, government and private sector, commitment is needed in order to make this work and sustainable.
Incorrectly targeted subsidies	Because so far, in the current situation, subsidised fossil fuel provided by the government is also being used by members of society with medium and high incomes. This leads to inefficient use of Government resources and hinders emissions reductions as fossil fuel use doesn't sufficiently decrease due to continuous demand of the medium and high income groups in society, which continue to buy and demand the fuel. This is also related to the Mafia of oil and gas (discussed below). This has also resulted in bioenergy not being promoted in the society. This could be a risk if the government continues to let this happen.	**To reduce emissions: don't destroy mangrove forest (save mangrove area > no reclamation)**	Keep helping and supporting the conservation of environment including mangrove area, which had been quite beneficial in environment sustainable development because it has many functions to keep maintaining the coastal area. This idea refers more to the emission reduction motion. And on the other hand, mangrove conservation could also produce many beneficial products to raise the economical sector of the coastal area by processing mangrove tree parts into many bioenergy products to be consumed.

Risks	Comment	Opportunities	Comment
The mindset of local society regarding bioenergy	People are not collecting feedstock which could be used for bioenergy because they are not aware of technologies transforming potential waste into energy	**Targeted subsidy in favor of vulnerable society**	Rather than subsidising wealthy people, it could be an opportunity of the government to act to make a decision or action of limiting the usage of fossil fuel and slowly replace it with bioenergy then apply subsidy on bioenergy products among vulnerable society.
Mafia of oil and gas	The gas and oil mafia who own the oil field and the importers keep creating demand in the society. It is important to note, that participants did not mean that figuratively but that apparently there are indeed criminal groups who control parts of the oil and gas sector.	**Feedstock abundant**	There are abundant resources that can be utilised as bioenergy feedstock.
		Spirit of local people	If people are well informed about opportunities, they could seize the opportunity to become dynamic actors of bioenergy developments
		Eagerness of government in saving the environment	Government have responsibility to care and act regarding to environment conservation. This can be one way to be optimistic.
		Seriousness of the government in tackling natural condition	Government should do something in term of social community development. If they can provide bioenergy which come from and for community. It will decrease the poverty condition which commonly happen in rural area.

Discussion of results:

This group assigned a score of 4, meaning “a little bit difficult to achieve”. Stakeholders stressed the need to focus on one region/village instead of many dispersed projects, establish a functioning value chain and then use this as a “model region/village”.

The group which consists of local government, farmers, NGO and academics suggested the following ways to move towards opportunities in pursuing the transition pathway:

- The first idea is the “Right on Target Subsidy”. So far, in the current situation, subsidised fuel provided by the government is also being used by the medium to high economic society and this is what the group called incorrect target of the subsidy. This way, the nation couldn’t even implement its policy and mechanism to reduce emission. This is also the reason why we can’t decrease fossil fuel consumption. The gas and oil mafia, who own the oil fields, and the importers keep creating demand in the society. As stated before that badly targeted fossil fuel subsidies occur due to the continuous demand of the medium to high economic level of the society, constantly buying and demanding the fuel. This is also resulting in lack of promotion of the impact of bioenergy for the society. This could be a risk if the government let this happen and could be an opportunity for the government to make a decision or act by limiting the usage of fossil fuel and slowly replacing it with bioenergy.
- The second idea is to keep helping and supporting the conservation of environment including mangrove areas, which had been quite beneficial to environmentally sustainable development, because it has many functions in order to maintain the coastal area etc.. This idea refers more to emission reduction actions. And on the other hand, mangrove conservation could also produce many beneficial products to raise the economic benefits of the coastal area, by processing mangrove tree parts into many bioenergy products to be consumed.
- A third idea (and also the main idea of this group) is that the use of wood pellets is the most attractive source of bioenergy available in Bali. However, there has been inconsistency in government policy. On one hand, the government promoted the use of organic fertiliser. This is good because organic fertiliser comes from livestock droppings and it does not harm the soil and plants. It is also much cheaper than chemical fertiliser. But on the other hand, the government also promoted the usage of chemical fertiliser, which many members of the group stated might be connected to the objective of both the government and the private sector to obtain profits and commission from a sales target of chemical fertiliser. As we know that chemical fertiliser harms the soil as it can change the acid level of the soil. It is also very expensive compared to organic fertiliser and villagers find it very difficult to afford chemical fertiliser and would prefer to use organic fertiliser.
- The last idea is to establish the cooperation between the locals, government and private sector; commitment is needed in order to make this work and maintain sustainability. In this case, government and the private sector must act only as the supporter and the locals should be the main actors who deal with the real situation. This way, if the government fails, a third party or the private supporter will be able to help. This cooperative strategy has already been implemented in Jembrana but it is sub-optimal as impacts and feedbacks are hardly or barely seen or found. This

means that the Jembrana case is an example where bioenergy developments have been implemented namely using wood pellets for cooking and the government has shown support by subsidising wood pellets and stoves. However, removal of the subsidies and resulting prices of biomass pellets result in the local community's hesitation in continual use of wood pellets. The price of the unsubsidised pellets is unknown to those using the cook stoves in Turkadaya village, but current estimates are IDR 1,300 per kg. Generally, 2kg is required per day for 2h cooking time (1h, twice daily), which would make the cost of pellets IDR 2,600 per day. On Day 1, one cook stove user expressed a willingness to pay up to IDR 3000 per day for cooking but the group felt that this view may not be held by all cook stove users. In addition, the locals desire more involvement in the wood pellets project, not only as the end-user (since most of them are farmers and they have the resources around them).

Group D – SCORE:	**5.0**

Members:

- Cynthia Ismail, su-re.co
- Jakfar Hari Putra, ICCTF
- Dr. Irhan Febijanto, PTSEIK-BPPT
- Gove Depuy, fiveelements
- Chrisandini, WWF
- Dan Vladinar, Ubud Sustainable Resort
- Budi Handojo, Bali Turtle island Development
- Angie Dewi Clark, PT. Gasifikasi Prima Energi
- David Harrison, DnD Consultant
- Dian Novita Wijata, BNI- ERM Division
- Gede Ary Suwedha, BNI – ERM Division

Table 4. H-form: Risk and opportunities for bioenergy development according to Group D

Risks	Comment	Opportunities	Comment
Regulation i.e FiTs	FiTs not fixed, have to be negotiated individually. Regulation should be communicated equally at the national, regional and village level.	**Feedstock/Resources**	There are abundant biomass resources that have not been utilised yet.
Bureaucracy of permitting, licensing, etc.	The bureaucracy is still complicated so it takes so much time to commence projects.	**Technology**	Technologies are readily available. If bioenergy projects grow in Indonesia, a variety of technologies can be deployed.
Regulation Banking services Authority (Indonesian name: OJK)	A regulation to fund a bioenergy project is not yet clear or detailed. Most projects dealt with by banks are related to palm oil, rather than other bioenergy.		
Risk assessment for funding bioenergy projects	The capability of the banking sector to recognise the risk of renewable technology is still lacking. This should be improved to motivate banks to provide fund or credit	**Funding from bank**	According to bank stakeholders in the group, there are many bioenergy projects that have been funded in Indonesia, especially palm oil. This demonstrates current support from the banking sector.
Incentives	Incentives are insufficient to make a project feasible.	**Pilot project**	Pilot bioenergy projects should be promoted as a reference for future projects.
Economic risks of large investments	It can be a risk because bioenergy projects entail high capital expenditure.	**Location or Region**	The development of bioenergy projects can increase the growth of a region.

Discussion of results

The group also emphasised that for successful bioenergy development, those risks had to be transformed into opportunities but regulation and red tape are the hindering factors.

Note: it appears that this group interpreted the second question on risks and opportunities as barriers (risks) and enablers (opportunities) to achieve the target.

Main identified risks (barriers):

1. Government should build a regulation to facilitate the activity e.g. feed in tariff, banking regulation, incentive. Even though the regulation was already issued, Feed in tariff is raised as an issue since the tariff still needs to be negotiated with PLN.
2. Bureaucracy should be less complicated (e.g. licensing, permitting), therefore the interests can be increased.
3. Capacity of the banking sector to identify the risk of projects to guarantee the sustainability of a project

Main identified opportunities (enablers):

1. Abundant resources have not been utilised yet
2. Technologies are available and ready to be applied
3. According to one of banks, there are already some renewable projects, especially palm oil projects that have been funded. It shows the support from banking.
4. The creation of pilot project as the reference for other coming projects.

Discussion 2: Which feedstock for bioenergy?

Based on the first group discussion exercise, participants were then invited to dig deeper and to discuss bioenergy developments in more detail during discussion exercise 2. The summary that follows presents the exercises as well as the discussions.

Exercise Structure: The 4 original groups were maintained from exercise 1 (A,B,C,D). Each group discussed the bioenergy potential in East Java and Bali and chose feedstocks which would, according to the group's view, be good options for producing bioenergy in Bali and East Java. No set output form was provided, each group was given flexibility to record the information as they wished. Some groups also elaborated on the impact (environmental, economic) and the potential (jobs etc.) of these technologies.

Group A

Table 5. Available bioenergy resources in Bali and East Java according to Group A

Feedstock	Current example
Rise husks/residues	
Sugar cane	East Java
Animal manures (1) (pig & cow)	Bali
Cocoa, coconut (oil & husk)	
Water lily (hyacinth) (invasive species)	
Sugar palm	East Java
Bamboo	Bangli, Bali
Cassava	
Calliandra wood	Madura, East Java

Discussion of results:

There are local cases in Bali where people do not have access to electricity, which the government needs to take it into account. For example, in Karangasem, Bangli and Tabanan regency. There are interested stakeholders who want to work on it but unable due to lack of support from the government/funding. At this moment, the current feedstocks used are pig and cow dung/manures for the biogas. In East Java, near the sugar cane plantation, there is a research institute which develops bioethanol using sugar cane waste and sugar palm.

There is also a biomass feedstock which is calliandra wood. It is currently used in Madura, East Java. It is a pilot project from the government to try the energy farm concept. They fund the farmers to plant calliandra trees to be processed for producing biomass wood pellets and animal feedings. The project is not completely successful due to lack of local demand for the wood pellets. They tried to export the wood pellets to Korea and other countries, but the quality and quantity are not good enough for international standards. Most members of the group are not from the field area nor do they have relevant field experience, hence are not in touch with the project much and so they don't really recognise the details of the project.

Group B

Table 6. Available bioenergy resources in Bali and East Java according to Group B

Feedstock location		
Bali	**Bali & East Java**	**East Java**
Pig Dung (Simantri Biru)	Casaug/	Sugar Cane Waste (Sugar Factory in East Java)
Corn Crops	Jatrova (pohon farak)	Cashew Apple
Cocoa	Cow Dung (Simantri program) (Biru Program)	
Bamboo Waste (Electricity Bangli)	Organic Domestic Waste, Human Waste (household, industry and hotel)	
	Coffee chems (coffee drier)	
	Coconut shells	
	Cooking oil residual (biofuel by government and private)	
	Abattoir waste, chicken drop waste	
	Sea weed + water hyacinth	
	Rice husks, rice straws (electricity in Buleleng)	
	Wood waste	
	Tofu industry waste	

Table 7. The impact resulted from bioenergy adoption according to Group B

Implication	Environment Impact
Efficient land use	Less waste, less methane
Energy availability	Less trad. Fuel consumption
Cost saving	Organic fertiliser
Reduce deforestation	Less indoor pollution
	Increased hygiene
	Reduced work load for women
	Reduce GHG emissions

Discussion of results:

The environment impacts:

1. Less waste
2. Less methane (GHG reduction)
3. Less treat
4. Fuel gas
5. Organic fertiliser
6. Less Pollution
7. Increase hygiene
8. Reduce the women's workload

The implications

1. Efficiency in land use
2. Energy availability
3. Cost saving
4. Reduce deforestation

Key issues

As there is so much potential and the possible positive impacts are significant maybe it would be good to increase the interest (optimism) in the people of Bali and East Java. Bioenergy has wide impacts, not only for the environment. However, consideration regarding the location in Bali is required, as highlighted from the experience of Angelina representing a private Biogas company. She said that it is quite difficult for her to develop new forms of energy such as biogas because she needs to develop it in an area without electricity, which is quite difficult to find in Bali.

Group C

The group discussed several feedstock options. Rice husks, water hyacinth, straw, sugar (bioethanol), waste (livestock waste like cow, pig or buffalo dung). Several examples were given as to the types of application for those feedstock: Biogas, Biomass, Biogas from manure, wood pellets, saw dust.

Discussion of results

The participants then discussed bioenergy developments and the impact on the national economy. They were of the impression that it would affect the economy (positively) if optimally supported by relevant stakeholders. One potential positive development in Bali and East Java was seen in minimising energy costs by shifting from fossil fuel to bioenergy consumption.

The group then discussed how those potential developments would affect their communities. Reducing energy costs was mentioned as were potential health and safety improvements. For example, bioenergy contains less chemicals that could harm people and participants pointed that it would also be safer to use. Wood pellets were used to illustrate this fact, which emit less smoke when burnt. Moreover, the group came to the conclusion that using wood pellets would be easier for users since they would not have to collect the wood anymore. Participants agreed on the fact that pellets would be more convenient since wood required drying beforehand, especially during rainy season.

Effects on the Environment

Participants then discussed how the environment could also benefit, because by promoting the usage of bioenergy it could contribute to CO_2 reduction. The waste management would not be too difficult according to participants since all saw dust, straws, coconut fibre, rice husks and livestock waste are easier to manage if used to produce bioenergy. For instance, the husks and straws are easily sold for brick making and processing into fertiliser. Chaff is also used for the preservation and handling of a watermelon.

Waste management was seen as another potential promising area in order to make sure it can be processed and reused as zero waste implementation. For example, the sustainable process of Sengon wood chips, saw dust, straws, hump, husks and coconut straws.

Other implications

There is also implication for land use, forest and waste management in a good way. It will minimise land degradation through vegetation function shifting, where people of the village could plant more than one kind of plant in only one area. The wastes are high-valued because they could be turned into valuable commodity.

Participants also provided concrete examples. They indicated that in their area, saw dust production would amount to 8 tonnes/week which could be used for wood pellets production. Moreover, farmers explained that rice straw is valued at IDR 2,000 per sack (a kind of a large bag made from strong plastic material), used for storing and carrying goods. A sack of approximately 10kg capacity can be used for brick kilns or

bioenergy. If there is high demand for it, farmers are also willing to supply as much as possible. This willingness is not only for the revenues because the farmers need to pay the transporting fees for disposal. Therefore, rather than paying to discard these saw dust and rice straws, they are more willing to provide it as bioenergy and be paid instead.

Finally, the group provided a concrete example on how to improve bioenergy uptake. They argued that it would be much better to focus on one model village where one could monitor the effects of the project and its impact (on sustainability for example) instead of establishing bioenergy projects in many places. Then, once the model has proven to be effective, it could be copied and used in other places (upscaling).

Group D

Table 8. Available bioenergy resources in Bali and East Java according to Group D

Feedstock	Technology - Location in Bali or East Java	Impact	Comment
Cashew husk	East Java	Energy security	firewood substitution for cooking
Cacao husk	Gasification or firewood substitution for cooking - Buleleng, Bali	Social/cultural	Social/cultural: Because these days the feedstock is waste, it is not utilised yet. But, if it had an economic value then the end users would collect the feedstock.
Rice husk	Gasification	Social/cultural	the utilisation of this feedstock will compete for other forms of commodity production (bricks)
Manure	Biogas – Jembrana	Economic: small business unit - Energy security	Economic: It will increase microfinance Energy: Producing electricity from waste will increase electricity access
Bamboo	Gasification bamboo-Bangli	Economic Social-culture	These are the first bamboo and wood biomass gasification projects for on-grid applications in the country. It will help to reduce greenhouse gas emissions

Feedstock	Technology - Location in Bali or East Java	Impact	Comment
Coconut husk	Wood pellets; Caliandra – Madura	Economic, energy security and social culture	Help improve local community fiscal sustainability and energy security.
Human Waste/Solid Waste	Biogas – still a plan to implement in Indonesia	Infrastructure because the project requires particular waste distribution	This is a new innovation but ethical factors need consideration
straw	Gasification-Bali	Economic	the price of feedstock determines available quantity.
saw dust	Wood pellets	Social-culture	Social/cultural: Because these days the feedstock is waste, it is not utilised yet. But, if it had an economic value then the end users would collect the feedstock.
Organic waste	Waste to energy – Suwung	Social-cultural	Social/cultural: The society will be forced to segregate their waste
Algae	Biodiesel – East Java	Economic and energy security	This project offers jobs and training to socially marginalised, underprivileged people, allowing them to improve their living conditions and the livelihoods of their families.
Cooking oil	Biodiesel (Lengis Hijau Foundation)– Denpasar	Economic, social/culture and energy security	It's constantly contributing to climate change mitigation and generating the use of bioenergy.
Red Calliandra	Wood pellets- Madura, East Java and Jembrana, Bali	- Economic - Energy garden	Economic: If the factory can be run, it will improve the livelihood of society, locally in particular

Discussion of results

The group emphasised that for successful bioenergy development, those risks had to be transformed into opportunities but regulation and red tape were hindering factors. The group identified several risks but also several opportunities.

As far as the risks are concerned, participants pointed out:

1. Social acceptance issues, especially when dealing with waste because collecting the waste is not yet part of 'the business'
2. A needed shift of habits in order to collect waste to produce energy is necessary. This might raise rejection by the communities since the waste is not usually collected and used for bioenergy uptake. Furthermore, collecting waste requires additional cost and resources (human, knowledge, technology, regulation) which are still lacking.
3. Although rice is considered as dominant commodity in Bali, the development of rice husks as bioenergy resource might be hindered because rice husks is, for example, also used for the production of bricks. To illustrate this availability issue, the group mentioned a 20 kW rice-husk power plant in Bali that does not operate due to the lack of resource availability.

However, several opportunities were identified as well.

1. Health: by collecting waste, any potential disease can be eliminated
2. Environment: reduce GHG emissions.
3. Economy: the increase of livelihood, especially locally.
4. Energy security: the increase of electrification also lead to an economic growth.

Participants then discussed a particular feedstock, Calliandra, for the production wood pellets

- 1 ha of land can produce approximately 40-60 tonnes per harvesting.
- The harvesting season is usually done after 1 year for first harvesting. However, the following harvesting cycles can be done every 6 months.
- The selling price of Calliandra as raw material: IDR 400,000-500,000 per tonne
- The price of Calliandra pellets: IDR 1,200 – 1,500/ kg
- According to a wood pellets actor, there are three types of pellet technology producers in Indonesia which are from China, Indonesia and Germany. The rough cost of each technology with 1 tonne/hour of pellets production is following:
  - China: IDR 1 billion
  - Indonesia: IDR 500 million
  - Germany: IDR 2-3 billion

After this exercise, the second day of the workshop came to a close.

Day 3 – Introduction

Taking into consideration the results and findings from the exercises of day 2, the objective of the third day was to shed some light on how the bioenergy potential in Bali and East Java could be exploited and identify any perceived obstacles along the value chain.

Discussion 3: Transition pathways achieving the vision: analyzing the value chain

Participants were divided into four groups while trying to respect as much as possible each participants' field of expertise and experience. Group 1 discussed the value chain of rice husks and other products for biomass pellets production, group 2 analysed the value chain for small scale biogas production from rice husks and other materials, group 3 discussed large scale biogas applications from rice husks and group 4 analysed the value chain of bioethanol from rice husks and other products.

Participants received a value chain matrix template with a predefined set of issue areas upon which to make an assessment (see Figure 6). The issue areas were "technology availability", "economic viability", "social acceptance", "institutional support", "financing availability", "behaviour, learning and innovation". The initial value chain consisted of the following steps: "Plantation", "feedstock", "collection", "processing", "production", "distribution", "end user" and "community". As each of the feedstocks and processes assigned to the groups for analysis has specific value chain steps, participants were free to add specific steps and issues as required.

Figure 6 Value chain matrix template used in the exercise

Value chain steps	Technology availability	Economic viability	Social acceptance	Institutional support	Financing availability	# of "3"
Plantation						
Feedstock						
Collection						
Processing						
Production						
Distribution						
End use						
# of "3"						

The analysis of the value chain during this group exercise is designed to identify vulnerable production steps and significant issues along the value chain which could negatively affect bioenergy development.

For the exercise, participants were asked to attribute numeric values from 0 to 3 for each step in the value chain related to the issue area according to the following rating system:

3 = significant difficulties in this step of the value chain occur that cannot be managed
2 = medium difficulties occur which can be managed
1 = few difficulties occur
0 = no difficulties in this step of the value chain

After extensive discussions, each group was asked to present the three value chain steps where the most difficulties had been encountered.

Group 1 – Rice to Biomass and Wood Pellets

No	Members Name	Institution	
1	Satya Kumara	Udayana University	Facilitator
2	Prima Amelia	Su-Re.CO	Note taker
3	I Made Budi Utama	Head of Tukadaya village	
4	Guntur	Forestry – Jembrana Regency	
5	David Horrison	DnD consultant	
6	Putu Anom	Tukadaya farmer	
7	Andre Primorio	DKM – Aliansi Tungku Indonesia/ Indonesia Stove Alliance (ISA)	
8	William Clark	PT. Gasifikasi Prima Energi	

Group 1 decided to amend the value chain by adding further steps in order to better reflect the realities of biomass and wood pellets production. The group started by discussing land and soil management before turning to the seeding and the actual planting process. The group then discussed the maintenance of the fields including the treatment of the plants with fertilisers and pesticides. The next step was identified as the harvesting procedure, with the following steps being the transport of the feedstock to the drying facilities. The drying process in this case involves using a one floor building where rice and rice husks are spread out to dry. After the initial drying of the feedstock, participants established an additional drying step where the material is transported to a milling site and then from there to a pellet factory in order to be processed into bioethanol or pellets. The table below outlines points raised during the group discussion.

Table 9 Value chain matrix of rice residues to biomass and wood pellets (Group 1)

Value chain steps	Technology availability	Human Resource	Economic viability	Social acceptance	Financing availability	Behaviour, Learning and Innovation	Institutional support
Land management	0	0	2	1	1	0	0
Seeding	0	0	1	0	0	0	0
Plantation	0	2	2	0	2	0	0
Maintenance	1	1	1	0	2	0	0
Plant disease protection	0	1	0	0	0	0	0
Pesticide and fungicide	0	1	2	0	**3**	0	0
Harvesting	2	2	1	0	0	0	0
Transportation	0	0	0	1	0	0	0
Drying	2	1	1	0	**3**	0	**3**
Storage	1	1	1	0	**3**	0	**3**
Re drying	0	0	0	0	0	0	0
Transportation (Road)	0	0	0	1	2	0	2
Milling	0	0	0	0	2	0	2
Transportation (to pellet factory)	0	0	0	1	2	0	2
Pellet factory	**3**	**3**	**3**	1	**3**	2	**3**
End Use	**3**	0	0	1	2	1	2

Discussion

In general, participants identified many issues that occurred during the processes of the value chain as below.

Land management

Participants discussed the fact that land is still largely farmed with manual labour. Increasing technology availability would make the work much easier and increase efficiency. However, implementing new technologies could also raise issues with regards to environmental awareness. So far, people are using the land coordinated by the Subak Abian method. It is a Balinese traditional organisation of farmers in the neighbourhood area in a village. It is mainly aimed at sharing responsibility in the management of gardens and cropping patterns to improve the welfare of farmers. Tukadaya Village has 21 Subak and Subak Abian separated into four Banjars.[1]

Transportation

The group was of the opinion that they would need one pellet factory close to the village. However, the community might be disturbed by heavy vehicles passing though the main road which could potentially damage it. On the other hand, if the banjar[2] would charge those vehicles passing through, the village could

[1] http://app1.pertanian.go.id/simluh2014/viewreport/rekapdesa_poktan.php?id_prop=51&prop_utuh=5101&b3=51011&kc=5101010

[2] Banjar is a division of administrative regions under the administrative of village in Bali. It is a legal community unit which has boundaries that are authorized to regulate and manage the interest of local community, based on the origin and the local customs. Banjar is recognized and respected by the Government administration system of the Republic of Indonesia.

benefit from additional revenues. So far, the group argued that this would not be a major issue and if it would become one, the group was confident that the villages will be able to manage it. In this case, financial support is needed in order to improve the road infrastructure.

Plantation and harvesting

This section of the value chain faces issues concerning human resources according to the group, because during the periods of planting and harvesting, the farms have barely sufficient labour available. Therefore, they would have to hire people who lack experience in farming which negatively affects production. In relation to financial issues, there is still no credit provided by Subak Abian. In terms of technological availability, the locals need the implementation of technology in order to optimise harvesting and decrease the manual methods for farming. For instance, advanced harvest machinery for threshing, drying and milling of paddy.

Fertiliser and Pesticide

The insufficient use of fertilisers affects the growth of the rice because farmers often don't have the financial capacity to buy enough fertilisers since fertilisers are not subsidised by Subak.

Drying, Storage & Milling

A new technology for drying is needed in order to ensure that the feedstocks are completely dry, otherwise they will get mouldy. Moreover, bigger storage facilities would be needed. Participants pointed out that milling facilities are still largely owned by individuals. It would be better if those milling facilities were owned either by Subak or by the villagers themselves.

End Use

In the end user segment of the value chain, technological availability and social acceptance were identified as main issues. In order to strengthen social acceptance, the issue is to induce an initial understanding and a behavioural change of farmers so that they start using wood pellets. When it comes to technological availability, it was also pointed out that one of the main issues was the lack of information about clean cook stoves. While they may be advertised, people in villagers simply don't have access to the relevant communication channels. In addition, the cooperation between factories producing the equipment and the farmers in terms of education and training were mentioned as potential issues. For example, farmers tend to use machines without knowing how to maintain the machines, which may result in the machine breakdown. In this case, the technology providers (either the government or the private sector) should work together with the farmers to monitor the usage and make sure there is regular maintenance of the machines.

Economic Cost

The group discussed that by cooperating closely, private sector players, the government and the farmers could build and run a pellet factory if every involved party would stay committed. However, the economic viability was not clear and a potential issue. For example, participants evoked the fact that reliable machines are rather expensive. This group compared different wood pellet machines , including German-manufactured and Chinese-manufactured machines alongside their estimated daily production capacity at a factory scale and smaller scale for use by individuals. A small scale pellet factory using a machine from Germany has the potential of churning out 5 tonnes pellets per hour would cost IDR 19 billion while a

cheaper Chinese machine would cost only IDR 1.9 billion for producing the same amount. However, on a small individual scale, people can only produce 3 tons of wood pellets per day. More importantly, farmers must also be educated on how to undertake the maintenance of the machine and be prepared for changes in the use of energy sources (switching from fossil to bioenergy). For the business sector, which produce wood pellets for sale and profit, there may be problems when both government and private sector becomes aware of the great potential of profit in this industry. This may lead to one player or another trying to dominate the industry to increase their own profit, which would mainly affect the village and the farmers negatively.

Conclusion

In summary, the main problem is institutional support from local government to develop biomass programmes. Other problems are technology (drying and storage) and financial support. Rice residuals can be made into biomass pellets; however, issues stated above need to be solved beforehand. The community also has to receive the stoves to use the pellets. The pellet factory should be built near the village to enable efficient biomass production.

Group 2 - Small scale, rice straws and husks to biogas

No	Members Name	Institution	Role
1	Indra Wirawan	Bali Turtle Island Development	Facilitator
2	Anna Carlsson	Su-Re.Co	Note taker
3	Robert de Groot	HIVOS	
4	John Clark	PT. Gasifikasi Prima Energi	
5	D.G. Weda Dharma	Yayasan Rumah Energi	
6	Jakfar Hary Putra	ICCTF	
7	Putu Witasra	Tukadaya Farmers	
8	Sayu Puspawati	Tukadaya pellet user	

Table 10. Value chain matrix of rice residues to biogas on small scale (Group 2)

Value chain steps	Technology availability	Economic viability	Social acceptance	Institutional support	Financing availability	Behaviour, Learning and Innovation
Plantation	0	1	1	0	0	1
Feedstock	0	1	1	0	0	1
Collection	0	1	1	0	0	1
Processing	**2**	**2**	0	0	**2**	**2**
Production	0	1	1	0	1	1
Distribution	1	0	0	1	1	1
End user	0	1	0	1	0	1

DISCUSSION

The group discussed the value chain for biogas from rice husks and other materials (rice straw, manure and food waste) for small-scale applications. This is already in use today in the regional province of Jembrana. However, a few barriers were identified early on. For example, rice straws are only available during harvest, which serves as a barrier for production of biogas, as it is a cyclical product, whereas organic waste (animal waste as well as kitchen waste) is available daily. A different problem arises in that today's digesters lack the technology of processing both animal and kitchen wastes. As such, rice husk or straw are not the primary feedstock suited for anaerobic digestion. One suggestion of a new method to process rice straws into biogas, without organic waste, would be to use enzymes similar to enzymes inside animals' guts.

Plantation

Although the charts did not indicate severe difficulties, the group discussed several barriers to successful biogas development at the plantation level. From a **technological availability** perspective, if there is a drought, farmers need to be close to the irrigation system called Subak. However this is normal in every village in West Bali to have, so this would not pose any significant difficulties. With regards to the **economic viability**, farms would face many barriers – e.g. mice, drought, etc., which results in crop failures, which may be compounded by climate change. **Land availability** with the lack of ownership was also mentioned as a huge barrier as was **social acceptance**. Participants mentioned that there was a lack of planters (labour) due to migration from rural to urban areas. As such, there is difficulty in finding farmers, as tourism offers a different and more appealing source of income for younger generations (participants did not consider this factor until the farmer in the group mentioned this as the main barrier). Similar arguments are used for **'Behaviour and attitudes towards changes'**. Those barriers are general issues that we are likely face in the future and is a general theme as a barrier for the following steps in the value chain too.

Feedstock

The feedstock step in the value chain has not been seen as riddled with many difficulties except for economic viability. Due to subsidised LPG by the government – affordability and willingness to pay for a digester varies. The question was asked as to who could access credit to buy a digester – and who would still be willing to pay? One option would be for the private sector to voluntarily show the digester model

to farmers, which enables them to build their own. However, economic viability depends on consistency. Moreover, with regards to the digestion of rice straw, rice straw is not viable in the short-term as it takes a long time to digest. Therefore, farmers see the benefits of burning rice straw to create nutritious fertiliser prior to the next rice crop. Long-term use of rice straws is not as viable because you lose the daily production of biogas from only animal waste. The discussion therefore switched to the use of manure and slurry for biogas production.

Processing

Technological availability: Bioslurry – even if technology is available to enhance liquid from bioslurry, there is still a need to find a solution for collection of many households' solid and liquid wastes for it to be viable. Currently, there is no interest in collecting small household amounts, as it would not be economically viable at such a small scale.

The maintenance of the infrastructure and machinery was also mentioned as a problem, for example for the digesters of manure. In total, there are 70,000 digesters in 10 provinces in Indonesia. HIVOS had installed 947 digesters with only 1.5% not working while 50% of the ones implemented by the government did not work. The difference between HIVOS successful digesters and the government's less successful digesters is that HIVOS spend more time and money on training and maintenance.[3] HIVOS small digesters cost IDR 7 million to produce and HIVOS pay IDR 2 million which is used for a 3 years guarantee and for training of farmers and manufacturers who do the installation, and the buyer (farmer) pays IDR 5 million. Digesters are installed at a distance of maximum 1 hour away from manufacturer's office for easy access for maintenance.

Production

Similar to group 1, group 2 also identified a lot of difficulties in the production stage of the value chain. With regards to the **economic viability,** the group was nevertheless under the impression that both biogas and enhancing liquid from bioslurry is a viable option to replace the use of the conventional gas such as LPG. This is because the improved organic solid and in particular the liquid bioslurry can be used as fertiliser to increase the crops on the farm itself, e.g. earth worms, mushrooms, duck weed, etc. But only 5% of HIVOS users are using the bioslurry because people are unaware that it is viable.

When it comes to **social acceptance**, participants pointed out that animal waste is generally accepted as organic waste to use for digesters, the only difference is that waste from pigs is accepted in Bali, but not in Java for religious reasons. However, human waste for use in biogas production is not socially accepted in either province.

When discussing **institutional support** participants asked why the government's digesters were not working. Some explanations were offered such as lacking long-term governmental policies and programs for biogas. Moreover, low price is emphasised resulting in low quality technologies and installations without training or after-sale technological maintenance. Another major barrier is the structure of a decentralised responsibilities to provincial and lower scales of government and the government tendering

[3] van Nes, W.J., Tumiwa, F. and Setyadi, I., 2009. Feasibility of a national programme on domestic biogas in Indonesia. SNV Netherlands Development Organisation. URL www. snvworld. org/en/Documents/Feasibility study Indonesia.

system. It was offered that government officials sometimes award contracts to build, for example, bio-digesters to contractors whom they know well on a personal basis. However, these contractors often focus on quantity (quick money) and not necessarily on quality and sustainability. This form of cronyism was said to be prevalent in Indonesia. A suggested solution by the group is a system of management control, which requires government to focus on the sustainability of funding and contracting and provide a long-term maintenance services such as education and training for farmers rather than the quantity of physical installation without any control on its quality.

Last but not least in the production step of the value chain, a lack of access to credit (**financing availability**) was identified as a major obstacle for the otherwise great potential for bioslurry use for bioenergy.

Distribution

Distribution of biogas was found by the participants not to be problematic for projects where biogas is produced and consumed within the household, but distributing biogas beyond the household for use by the community or neighbouring communities faces many challenges related to pipe distribution or redirection of the gas. This is due to the cost of compression for pipeline transport as well as corrosion issues in pipelines themselves. There are also difficulties for distribution to large storage as well as storage facilities during non-harvesting season. Alternatively, one suggestion to overcome the barrier of distribution is to install a large-size digester in a village among many households, in order to produce biogas for use in one big cooking facility.

The group then discussed several policy options which could be taken up by the government in order to boost bioenergy potential in East Java and Bali.

Policies and actions*:*

- Governmental support should be complimentary to support from private sector because today, government policies would hinder the capabilities of other actors;
- The private sector should assume an advocacy role to raise awareness and to make full use of the social entrepreneurship/enterprise potential;
- "Middle management" – the private sector should play the "middle man" role to fill the gap between the government and the end user;
- Efforts for regulation to provide financial incentives such as feed-in tariffs;
- There is a province/regency level governance problem since there is no transparent administrative connection and line of reporting from Jakarta to Bali and this needs to addressed;
- A new system structure was devised: The government should enable capacities from the private sector to contribute with knowledge, experience, etc. to the program to meet targets. "Bottom-up" – private sector to get local/community perspective and report feedback (consultation) to central government – coordinate to fill gap which exists today between central and provincial/regency government. (Possible solution would be franchising bioenergy);
- Additionally, an action/policy suggestion was that raising and increasing awareness should be applied to all value chain steps and processes.

Conclusion

The participants of group 2 saw the amount of rice straw and husk as being insufficient for producing biogas. They agreed that animal manure is also required in order for the process to function. Changes of land use in Bali become an issue for the biogas development, as farmers tend to sell their land for business development. It is also affected by the decreasing number of farmers, especially planters who would be needed to labour in the rice fields.

It is important to note that some installed biogas digesters are not functioning, mainly because there has been lack of technological maintenance and know-how to allow for proper maintenance. This issue needs to be taken into account by all stakeholders - not only by the government but also third parties such as NGO and private business. Apart from those issues, the most serious challenges to biogas development in Indonesia were identified as lack of financial support, technology approach and the certainty that those things will come right on target to the farmer who needs. Nevertheless, awareness and behaviour are still important challenges.

Group 3 - Large scale, rice straw and husk to biogas

No	Members Name	Institution	Role
1	Prof. Dayu Giri	Udayana University	Facilitator
2	Cynthia Ismail	Su-re.Co	Note taker
3	Dian Novita	BNI	
4	Dody Virgo C.R Sinaga	PPK Satker MWA ICCTF	
5	Fabby Tumiwa	IESR ICCTF	
6	Okky Prasetyanto	DKM – Aliansi Tungku Indonesia	
7	Angela Clark	PT. Gasifikasi Prima Energi	

Their discussion result is shown on this table below:

Table 11 Value chain matrix of rice residues to biogas on large scale (Group 3)

Value chain steps	Detailed value chain steps	Technology availability	Economic viability	Social acceptance	Institutional support	Financial availability	Behaviour, Learning and Innovation
Plantation	Planting	0	0	0	0	1	0
	Harvesting	0	0	0	0	1	2
Feedstock	Husk	0	2	0	0	1	1
	Straw	0	1	1	0	1	1
Collection	Husk	0	1	2	1	3	1
	Straw	0	3	1	1	3	1
Processing	Pre treatment	0	2	2	1	3	1
	Anaerobe process	3	2	1	2	3	1
Production	End produce (KWh)	2	3	3	2	3	3
Distribution	Electricity	1	2	1	1	3	1
Location		0	3	3	2	3	3

Discussion

Plantation & Harvesting

Overall, participants did not see any significant difficulties in the plantation stage given the available technology, the institutional support for plantation is sufficient therefore economically viable. The availability of bank credits for fertilisers, machines etc., distributed by farming communities was also mentioned. Subak and Subak Abian forms of governance as mentioned in other group discussions also help with the harvesting process. However, it was pointed out that the harvesting process was often hindered by so-called Tengkulak – or unscrupulous and unofficial providers of credit[4] - which would add some additional costs. This occurs in Balia, but not in East Java.

Feedstock

In terms of feedstocks, rice husk and straw were discussed given the availability in Bali. Participants assessed the economic viability positively. However, sometimes cooperation among farmers is required as the capacity of one farmer to another is different. Group members stated that 1 tonne of rice grain would yield 1 tonne of rice straw. In terms of economy, labour costs are more problematic than feedstock costs. Furthermore, availability of sufficient finances was assessed as a little problematic for rice husk and straw but participants also agreed that it was a manageable difficulty because of the availability of bank funding for several activities such as land management and land rejuvenation which is usually done through a farmers' association. However, money sometimes reaches only top level associations and can't be used for the daily needs of farmers but only for farming purposes. Moreover, the need for all farmers to benefit equally was stressed in the group discussion.

Collection and Transportation

For both rice husk and rice straw, participants did not see significant difficulties in terms of technology availability. However, it was pointed out that certain crops would be cultivated far away from commercial opportunities to sell them which would add some further costs. Additional labour (often from external communities) might be required for collecting both rice husk and rice straw which also means additional costs for farmers. In addition, it was pointed out that biogas production from rice straw required greater quantities of input materials than if biogas was produced from rice husk. For transportation, collecting straw is more problematic because it is widely distributed in many different paddy locations. In terms of social acceptance, there is no significant hindrance as it is what the farmers normally do. However, the level of acceptance can be higher if there is an additional incentive for collecting both rice husk and straw. There is no centralised institutional support to collect these feedstocks yet, only from the farmer association. Therefore, financial support often comes only in ready-made packages which often are inflexible and don't cater to the farmers' needs. For example, while banks might provide finance during plantation and harvesting season, they might not provide funding for collection and transportation of

[4] loan shark middle men traders, who would loans to farmers at the beginning of planting season at a high interest rate. During the harvest, market price will fall, and the farmers would end up just breaking even, or even owing the tengkulak more money. This leads to farmers being trapped in poverty cycles for decades, and unable to break free.

feedstocks. From the bank's point of view, there is a risk to fund those kind of projects because there is no long-term record of using the feedstock for bioenergy so there is no perceived guarantee of payback. In terms of value, most people in Bali recognised the value of rice residues as a feedstocks for bioenergy so their behaviour is not a significant barrier.

Processing

Participants agreed that while there were two technologies for large-scale bioenergy from biogas: biomass gasification to produce synthetic gas for electricity production and large-scale anaerobic digesters to produce biogas. Both technologies are available they are very import-dependent meaning that lots of spare parts and machines are imported from foreign countries. This can sometimes lead to long and time-consuming processes to acquire all necessary parts. Moreover, "economic viability" was identified as problematic since the necessary skills amongst the labourers are relatively rare. People would still follow the "learning by doing approach". Regarding the social acceptance of bioenergy processing facilities by communities, it may not be a big problem since participants thought that communities near the processing facilities would accept those facilities because they would see biogas as something useful. There is, however, a risk if the harvest fails at some point. A thorough study based on a particular site is necessary to apply available technologies in that specific context. Participants agreed that there are too few of those specific studies and the know-how to do them is sometimes insufficient. The climate in Indonesia also differs significantly from the sites in which existing case studies have been undertaken, that would need to be accounted for in specific Indonesia-based studies.

Production

In terms of technology, participants argued that its efficiency is still low. The economic viability is still problematic in terms of costs (engines and turbines) and the labour skills are limited. Biogas production does not get full attention from institutions, such as the government and the group argued for more institutional support. Financial availability was also identified as problematic because the risk is still big (for example the gas quality is still low), which may affect the production and payback, and therefore the willingness of banks to lend money. Participants felt that social acceptance of large scale biogas production has not yet been tested but would follow once issues related to technology availability and economic availability were addressed. These are therefore a more significant hindrance of the project implementation than social acceptance at this early stage.

Distribution

When it comes to the distribution of electricity from biomass gasification generation facilities, participants identified "technological availability" as a bit problematic especially the installation of electricity transmission and distribution lines. Similarly, should biogas itself from anaerobic digestion be distributed for use as a gas or for electricity production at another location, laying gas pipelines could pose difficulties. Economic viability was also identified as a barrier for successful large-scale biogas development, particularly when the plant is far from the end-user location, because the installation of distribution lines would be a hindrance. For example, in order to avoid leakage in distribution of gas, transmission pipelines should be straight and there should be few connections. However, the lay out of the houses (terrace system) and the soil structure (uneven) would make the laying of straight pipes difficult. Social acceptance was identified as an issue since it would be tricky to find the proper location for distribution line

installation. As far as "institutional support" is concerned, the service would be available but it takes more time until the successful installation of many components which, for large-scale anaerobic digesters for example, include inlet (mixing tank), bio-digester, gas container (the dome), manhole, outlets and overflow, main gas pipeline and distribution pipes, water drain, pressure gauges and turbines or electric generator sets, depending on the scale of the facility. In addition, financing these installations is a significant problem as it is novel and therefore risky from a bank's perspective. Behavioural change is manageable but might require better education and training.

Location

Location was discussed as a problem of land acquisition to build the plant. However, participants stressed the fact that this would be a problematic issue even for other energy projects. The land in Bali is costly. It appears people do are not well informed about why certain land would be used for bioenergy developments and banks often don't provide funding. Moreover, participants argued that management of land use would be insufficiently regulated. It requires therefore close cooperation between local communities and local institutions as well as information campaigns to raise awareness about plants and their local impacts.

Conclusion

In summary, group 3 believed that large scale biogas production from rice residues did not look promising due to issues related to the economic viability. Fertiliser usage was mentioned as a more realistic use for those rice residues. Participants expressed their opinions that the technology was not really suitable and difficult to transfer from abroad to Indonesia. Moreover, participants evoked the lack of social acceptance of biogas installations by the community because of low incentives or direct benefits for the community. In terms of land use, due to the high cost of land in Bali, it it is more difficult for a large-scale business development.

Group 4 - Rice residues (bagasse, a sugarcane residual and Napier Grass) to bioethanol

No	Members Name	Institution	Role
1	Lina Moeis	Yayasan Rumah Energi	Facilitator
2	Ippah	Udayana University	Note taker
3	Chrisandini	WWF	
4	Budi H.	Bali Turtle Island Development	
5	I Made Suastra	Tukadaya farmer	
6	Sayu Putuluwih	Tukadaya Pellet user	
7	Gede Ary	BNI	
8	Sigit Hariyanto	Departement of New, Renewable, and Energy Conservation, MEMR	
9	Drs. Andianto Hidayat, MSc	Technology and Product Development Manager - Gas Directorate, PT. Pertamina	
10	Rudi Salim	PT. Gasifikasi Prima Energy	
11	Dr. Irhan Febijanto	BPPT	

Table 12 Value chain matrix of rice residues to bioethanol (Group 4)

Value chain steps	Detailed value chain steps	Technology availability	Economic viability	Social acceptance	Institutional support	Financial availability	Behaviour, Learning and Innovation
Plantation	Sugar Company	0	0	0	0	0	0
Feedstock		0	0	0	0	0	0
Collection		0	1	0	0	0	0
Processing	Chemical processing, extraction and distillation	0	1	0	0	0	0
Production	High production cost	**3**	**3**	0	0	0	0
Distribution		0	0	0	0	0	0
End user (Pertamina)		0	**3**	**3**	**3**	**3**	0
Community		1	2	1	1	1	0

Discussion

Group 4 decided to analyse bioethanol production from "Napier grass" (cultivation by PERTAMINA) and "bagasse" (sourced from an unidentified sugar company) as feedstock examples for the exercise.

Plantation, Feedstock, Collection and Processing

Concerning the plantation and feedstock value chain steps, the group agreed that the potential of using rice straw for producing bioethanol is greater than rice husk, as rice husk is too fine. The availability of rice paddy throughout the year is a promising prospect for bioenergy in Indonesia. However, an obstacle for using rice paddy is land tenure, as plantations are owned and managed by communities/farmers, and not the government. Furthermore, and even though it consumes a lot of fertiliser, Napier grass was seen as an alternative to rice paddy because it is easy to grow and does not require much treatment and has a good resistance compared with rice paddy. The required cultivation period before processing is about 3 months, which can be done all year round. Bagasse is a residue product from sugar cane harvesting and sugar-extraction and requires 6 months to grow and is seasonal. Overall, the value chain steps from **"plantation"** to **"processing"** seemed to be less problematic for the group and there seemed to be no issues since the technology to produce bioethanol from bagasse and napier grass has already been proven and the feedstock would be available in large quantities. The feedstock comes from existing plantations located next to the sugar company which is why, in the example discussed, the value chain step **"collection"** was seen as unproblematic. The blending of the bioethanol product with other fuels is done in the nearest PERTAMINA fuel depot. The main advantage for the sugar company participating in the bioethanol production is that it gets additional revenues from selling sugar cane waste. Nevertheless, PERTAMINA mentioned that for a planned bioethanol production facility, they would need a consistent supply of feedstock. To offset the risks, PERTAMINA has started to farm Napier grass in a 80,000 ha area as a substitute feedstock for bioethanol production. A Napier grass plantation of around 9,000 ha would produce the equivalent of 300,000 tonnes of bagasse a year. This optimisation strategy would allow substitution of bagasse for Napier grass in order to maintain the sustainability of feedstock in the event bagasse is not available in sufficient quantities.

For the **processing** phase, the group identified the possibility that bioethanol would sometimes be at the incorrect grade in order to be blended with conventional gasoline.

Production

The main problem areas identified were in the **"production"** and **"end user"** stage. One main issue in the "production" step was identified as pricing. One problem, for PERTAMINA, was that the crude oil price was too low for financially viable development of bioethanol. Currently crude oil is priced at USD 40 per barrel. However, at least 80 USD per barrel would be required for bioethanol production to be price-competitive with gasoline. This would translate to a higher price of bioethanol-blended fuel at the pump (IDR 9,000 per litre and this is expected to increase in the future) compared to the standard gasoline price which is about IDR 7,000-8,000. It would be difficult for communities to accept such a price difference unless subsidies are provided by the government. Alternatively, consumers would have to be convinced of the benefits of allowing PERTAMINA to sell at market prices.

Besides the low oil price, another reason as to why bioethanol production is not financially viable is the fact that the technology for the second generation bioethanol requires a license from Italy and America. The production requires a large amount of investment and the logistics are expensive. Due to the high price of bioethanol processing, sugar products are currently only in food and drink.

The group noted that there are regulations set in place to encourage bioethanol usage. The Minister for Energy and Mineral Resources released a provision in MEMR Regulation No.20/2014 that there are penalties for blending ethanol with subsidised gasoline and requirements for blending rates of 2% and 5% bioethanol with non-subsidised gasoline for consumption in the industry and commercial sectors as well as private transportation use. It is targeted increase to 10% and 20% by 2020 and 2025. Furthermore, it's also mentioned that small enterprises, fisheries, agriculture and public transportation sectors need to blend their fuel usage with 1% bioethanol in 2015, 2% in 2016, 5% in 2020 and 20% in 2025.

There is currently a bioethanol production facility located in Surabaya, with a capacity about 40,000 kL/year and an operating capacity of about ± 35,000 kL/year. Moreover, the government has already designed a new bioethanol fuel company (second generation) in Cirebon next to PT. Rajawali Nusantara Indonesia (PT. RNI)[5] with the capacity 76,000 kL per year at a very high investment of around 400 million US dollar. The second generation bioethanol processing will utilise residuals from the sugar company. This second generation process uses a distillation method with cellulose, hemicellulose, and lignin enzyme to digest the lignocellulose. The injection (blending of gasoline and ethanol) can be processed by PERTAMINA but there is a technological obstacle, which would have to be addressed before bioethanol production can become efficient and profitable. Andianto Hidayat from Pertamina said that the obstacle is a purely technical problem in blending bioethanol product. It happens in the process to the truck tank that will deliver products from a fuel depot to retail outlets. Since ethanol is hygroscopic, it will be injected into the current fossil fuel and loaded into tank trucks (inline blending system). Currently, the regulation of ethanol blending volume with gasoline is small (2%). Therefore, it is necessary to install a special injector to enable a very small volume flow against the current fossil fuel pressure. However, this obstacle was already solved in three fuel depots of PERTAMINA in Plumpang, Ujung Berung and Surabaya.

Conclusion

Overall, Group 3 came to the conclusion that the main obstacles for successful bioethanol development arose in the production and end user stages. PERTAMINA does not want to distribute bioethanol-blended fuel at the same price as standard gasoline because it would not cover costs. As agreed by the group, the

[5] PT is an acronym for Perseroan Terbatas, a term that represents a limited liability company in Indonesia. PT RNI is a State-Owned Enterprises engaged in agro-industry, pharmaceuticals, and trade that are integrated from upstream to downstream, including sugar to bioethanol.

main obstacle for the development of bioethanol is the lack of government commitment on subsidies or the regulation of the market price. The group clearly perceived that the responsibility lies with the government to provide support by giving incentives to bioethanol companies. Furthermore, the end users were attributed a high difficulties score since the group assumed that they were unwilling to pay higher prices for bioethanol.

Discussion 4: Overcoming top issues for successful bioenergy development

Session-overcoming top issues by policy and action on bioenergy development

Issue/condition	Issues	Solution	Stakeholders
End user of bioethanol	Regulation on pricing, 2% not viable due to regulated price.	Develop market price, price signals	Ministry of finance, MEMR, legislatives/house of representatives
Production of bioethanol	Feedstocks may have other higher value applications in the future such as animal feed and incineration in boiler	Regulation should not put values on waste License for technology should be paid by the government Incentives for local technology industry	Public works ministry, forestry ministry, industrial ministry, applied technology agency
Awareness on biogas local scale	Targets not achieved	Revise procurement processes and target setting process with help by the community and other stakeholders Establishing partnerships	Private sectors, PLN, government
Economic viability	Energy market is hampered by the power of monopoly state companies Liberalization has not worked in the past	Diversification of energy sources Get financial incentives right Financing from government and banks	PLN, IPP, government
Drying and storage of biomass wood pellets	Drying and storage are not optimal (limited capacity) In terms of regulation 1 billion IDR only for livestock (local cooperative institution) Pellets sourced from Java	Improve the processing and cooperation amongst institutions. Establish drying station Increase financing for the industry, drying and pellet factory Education for local about pellet factory	Community, private sector, government (for initial capital), local farm organization

Lessons learned

At the conclusion of the workshop, the team of organizers gathered to discuss the experience with the aim of learning how to improve in successive workshops. All agreed that participants were deeply engaged in the exercises and discussions throughout the workshop, which required a significant dedication of time and energy. As a result, there was a very valuable exchange where participants and organizers alike learnt a great deal and developed good networks with colleagues in the bioenergy sector in Indonesia.

The following lessons from the workshop will help us consider how to improve on past efforts and provide a good environment and productive space for future discussions and workshops:

- Co-hosting with the government ensured the workshop had good attendance and high profile speakers.
- Detailed background analysis of the policy and technologies involved in the case study was important for planning a workshop that was useful for participants as well as organisers.
- Prepare fully but be flexible to adapt exercises and time schedules to fit workshop discussions.
- Keep in mind that the first workshop is the first opportunity to get to know the stakeholders and that subsequent engagement can be used to deepen the analysis. We developed a “fellowship” to build the stakeholder group and maintain contact between workshops.
- Record expectations of participants at the beginning and review them at the end of the workshop to see if they have been met.
- Expressively ask participants for consent to use photos and videos from the workshop on social media in signed consent forms.
- Take care with group composition in exercises, using both homogenous and heterogeneous groups to promote discussion depending on the exercise.
- Take advantage of the rich collaborations established at the workshop by building a network for ongoing discussions and cooperation among participants and organisers.

Next steps

According to the workshop documentation and data found, we established a Fellowship of Sustainability and Resilience of Bioenergy for Climate Change in the formats of both mail list and social media (Facebook). This fellowship is intended to maintain the networking and as an open discussion in this kind of important issues.

Moreover, due to the interest and positive response to this year's International Workshop on Sustainability and Resilience (Su-re) of Bioenergy for Climate Change: Scoping and Envisioning from both of participants and consortium members, we plan to organise follow up workshops each year for the remaining two years of TRANSrisk and GreenWin project implementation. Our future aim is to support exemplary solutions, promote sustainable business model and enabling conditions regarding bioenergy and climate change. This may take place in the middle of 2017.

Annex 1: Agenda

DAY 0, TUESDAY 10TH MAY 2016		
TIME	ACTIVITY	NOTE
Personal arrival estimation at 9th		
11.00	Informal Greeting from Udayana University	
11.30	Lunch	
13.00	Travel to Jembrana and have a short Sightseeing in Tanah Lot	
	Meeting point in Jimbarwana Hotel	Approximately 3.5 hours from airport
17.00	Registration all the Participant	
19.00	Relax and dinner	
DAY 1, WEDNESDAY 11TH MAY 2016		
TIME	ACTIVITY	NOTE
	FIELD TRIP	
07.00	Prepare & Check out	
08.00	Brainstorming on energy innovations for green livelihoods	Presenter : Guntur, Senior Staff on Forestry Department Jembrana Regency
08.30	Field Visit to Bioenergy site	Coordinate by Tya
10.15	Move to Wood Pellet Field visit	Coordinate by Tya
12.00	Traditional Lunch Break	Accommodate by Tukadaya's Headman, Mr. I Made Budi Utama
14.00	Move to Canggu – Bali	Approximately 3 hours travel
17.00	Check in Grand Balisani Suites	
18.00	Free time	

DAY 2, THURSDAY 12TH MAY 2016		
TIME	ACTIVITY	NOTE
08.00	Registration	
08.50	Warm up	
	Introduction to GreenWin and TRANSrisk Indonesia Case	
09.00	Welcome & recap of Day 1 and introduction to GreenWin and TRANSrisk project	Presentation: Prof. Takama Takeshi, Udayana University
09.20	Overview of this workshop	Prof I Made Suastra, Vice Rector IV Udayana University
09.30	Opening speech on Vision for Sustainable Bioenergy in Indonesia Deputy Director Climate and Weather of the National Development Planning Ministry of National Development Planning Agency (Bappenas)	Ibu Syamsidar Thamrin, On behalf of Director of Environment Ministry of National Development Planning Agency (Bappenas) as the Secretary of the Board of Trustees (BoT)
09.40	Introductary Session of The Work Package	Presentation: Louis Lemkow Zetterling
10.00	Refreshments and photo session	
	Vision for sustainable bioenergy in Indonesia	
10.20	Introduction of Scoping and Envisioning.	Presentation: Background of Climate Policy in Indonesia- Stefan Bosner
10.30	Report of of Previous FGD about the Current Bioenergy Situation in Jembrana	Presenter: Ibnu Budiman
10.40	The Ecosystems Services approach to analysing biofuels projects and programmes	Presenter: ESPA Fellow, SEI-Africa Centre - Anne Nyambane
10.50	Clarification of the presentation	Short discussion
11.00	Participants Introduction Themselves	Participants say about their expectation and what they can contribute for this workshop
11.20	Group session 1 Contributing to sustainable bioenergy in Indonesia: visions for Bali and East Java	Facilitation: Dr. Erwin Widodo & Prof. Takeshi Takama
12.45	Lunch	
13.40	Group session 1 Continued	Facilitation: Dr. Erwin Widodo & Prof. Takeshi Takama
14.40	Parallel group session 2: Participatory value chain mapping: bioenergy in Bali and East Java	Facilitation: Dr. Erwin Widodo & Prof. Takeshi Takama
15.10	Coffee break	
15.40	Group session 2 Continued	Facilitation: Dr. Erwin Widodo & Prof. Takeshi Takama
17.30	Close of the day	Closing speech: Takeshi Takama
18.00	Meet in *Turtle Open Stage* and joint welcoming dinner with Balinese Dance performances in Grand Bali Suites, Canggu.	Speech: Dr. Erwin Widodo, Executive Director of ICCTF

DAY 3, FRIDAY 12TH MAY 2016		
TIME	ACTIVITY	NOTE
09.00	Welcome, recap of Day 2 and introduction to Day 3	Speech: Prof. Takeshi Takama, Universitas Udayana
	Transition to Sustainable Bioenergy in Bali and East Java	
09.15	Parallel group session 3: Transition pathways to achieve the vision: analysing the value chain	Facilitation: Prof. Dayu Giriantari & Prof. Takeshi Takama
10.15	**Refreshments and coffee break**	
10.45	Group session 3 continued	Facilitation: Prof. Dayu Giriantari & Prof. Takeshi Takama
12.00	Lunch Break and Prayer time	
13.30	Group session 3 continued	Facilitation: Prof. Dayu Giriantari & Prof. Takeshi Takama
15.30	Conclusions and next steps	Takeshi Takama
16.00	End of Meeting and Refreshments	Short speech: Prof. Takeshi Takama on behalf of Prof I Made Suastra, Vice Rector IV Udayana University

Annex 2: Participants

No	Name	Institution	Position
1	Louis Zetterling	ICTA-UAB	Professor
2	Anet Duncan	ICTA-UAB	Disemination
3	Stefan Bößner	SEI	Researcher
4	Francis	SEI	
5	Anne Nyambane	SEI	Researcher
6	Tim Suljada	SEI	Project Manager
7	I Wayan Suwerayasa	Udayana University	Lecturer
8	Imroa'tul Ippah	Udayana University	Lecturer
9	Ida Ayu Giriantari	Udayana University	Lecturer
10	Satya Kumara	Udayana University	Lecturer
11	I Made Suasrta	Udayana University	Vice Rector IV
12	Dari Puspa Arini	Udayana University	Magister student
13	Tharapom Khanpannya	Udayana University	Magister student
14	Erwin Widodo	ICCTF	Executive Director
15	Jakfar Hari Putra	ICCTF	Energy coordinator
16	Joseph Viandrito	ICCTF	Deputy Program
17	Dodi Virgo	ICCTF	Deputy Finance
18	Siwi Handinah	ICCTF	Administrator
19	Ni Komang Widiani	ICCTF	PME Manager
20	Jatna Supriatna	MWA ICCTF	RCCCUI represenative
21	Fabby Tumiwa	MWA ICCTF	Civil-IESR representative
22	Takeshi Takama	su-re.co	CEO
23	Ibnu Budiman	su-re.co	Researcher
24	Auditya Sari	su-re.co	Research Assistant
25	Cynthia Ismail	su-re.co	Research Assistant
26	Anna Carlsson	su-re.co	Intern
27	Florian Radigue	su-re.co	Intern
28	Laksmi Pratiwi	su-re.co	Office Manager
29	Rumi Takama	su-re.co	
30	Prima Amelia	su-re.co	Interpreter
31	I Made Budi Utama	Tukadaya Village	Headman of village
32	Sayu Putu Luwih	Tukadaya Village	Minimoto stove, wood pellet user
33	Sayu Kadek Puspawati	Tukadaya Village	Minimoto stove, wood pellet user

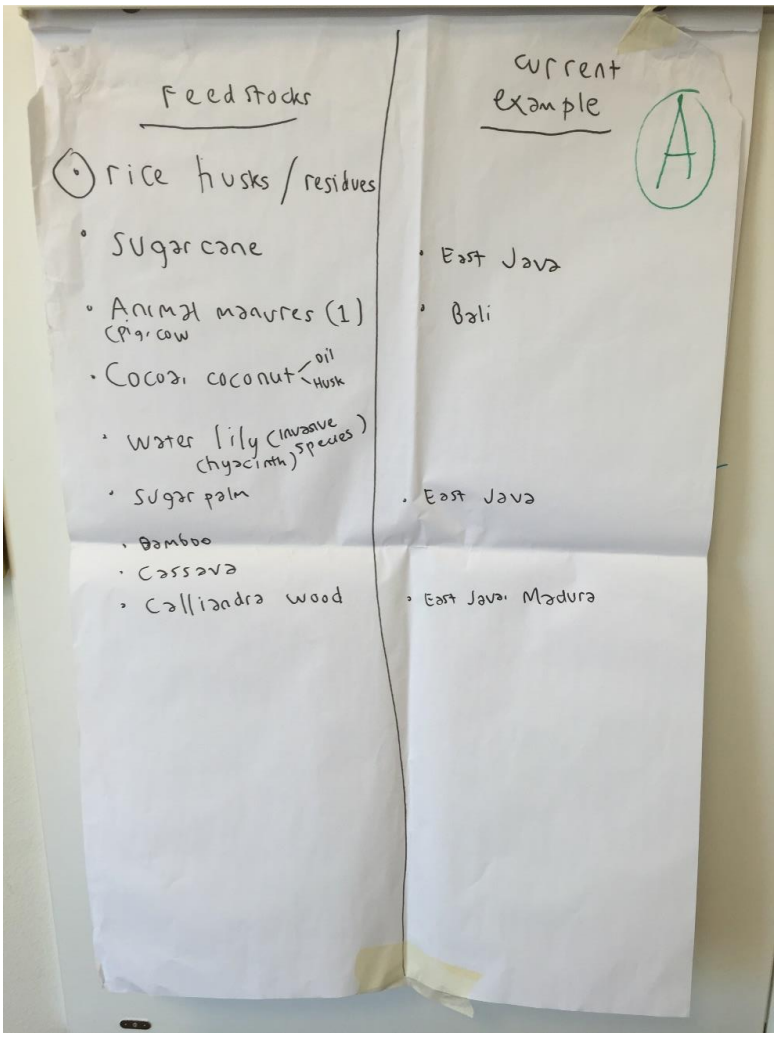
No	Name	Institution	Position
34	I Putu Anom Darmadi	Brawantangi, Sub of Tudakaya village	Head of farmer community
35	I Putu Winastra	Sari Kuning, Sub of Tukadaya village	Head of farmer community
36	I Made Wastra	Pangkung Jajang, Sub of Tukadaya village	Head of farmer community
37	I Made Winata	Brawantangi, Sub of Tudakaya village	Head of sub village
38	I Putu Ariawan	Brawantangi, Sub of Tudakaya village	Head of farmer community
39	I Putu Anom Darmadi	Brawantangi, Sub of Tudakaya village	Head of farmer community
40	Ni Made Ayu Suarningsih	Sari Kuning, Sub of Tukadaya village	Head of sub village
41	Yayan Nerka	Sari Kuning, Sub of Tukadaya village	Vice
42	Gede Sagung	Sari Kuning, Sub of Tukadaya village	Treasury
43	I Komang Ariawan	Sari Kuning, Sub of Tukadaya village	Head of farmer community
44	I Wayan Yandha	Sari Kuning, Sub of Tukadaya village	Head of farmer community
45	I Made Widana	Pangkung Jajang, Sub of Tukadaya village	Head of sub village
46	I Ketur Ariata	Sombang, sub of Tukadaya village	Vice
47	Syamsidar Thamrin	Climate Change Departement, Ministry of National Development Planning	Head of Climate Change Departement
48	Guntur	Forestry Agency, Jembrana Regency	Senior Staff
49	Dr. Irhan Febijanto	PTSEIK-BPPT	
50	Sigit Hargiyanto	Ditjen. EBTKE, Kementerian ESDM	Direktur Bioenergi
51	Gove Depuy	Fiveelements	Consultant
52	Chrisandini	WWF	Climate Change Departement Manager
53	Robert de Groot	Hivos	Manager
54	Dan Vladinar	Ubud Resort	Environment Departement Manager
55	Indra Wirawan	Bali Turtle Island Development, Sanur	Operasional Manager
56	Budi Handojo	Bali Turtle Island Development, Sanur	General Manager
57	Dewa Weda	Yayasan Rumah Energi	Quality instalation technician
58	Lina Moeis	Yayasan Rumah Energi	Executive director
59	Drs. Andianto Hidayat, MSc	PT. Pertamina	Technology and Product Development Manager - Gas Directorate
60	Angie Dewi Clark	PT. Gasifikasi Prima Energi	Project Manager
61	John Clark	PT. Gasifikasi Prima Energi	CEO
62	William Clark	PT. Gasifikasi Prima Energi	Operasional Manager
63	Rudi Salim	PT. Gasifikasi Prima Energi	Finance Manager
64	David Harrison	DnD Consultant	Lawyer
65	Dian Novita Wijaya	BNI - ERM Division	Manager
66	Gede Ari Suwedha	BNI - ERM Division	General Manager

No	Name	Institution	Position
67	Andre Primorio	DKM - Aliansi Tungku Indonesia	CEO
68	R Oky Prasetyanto	DKM - Aliansi Tungku Indonesia	Operasional Manager

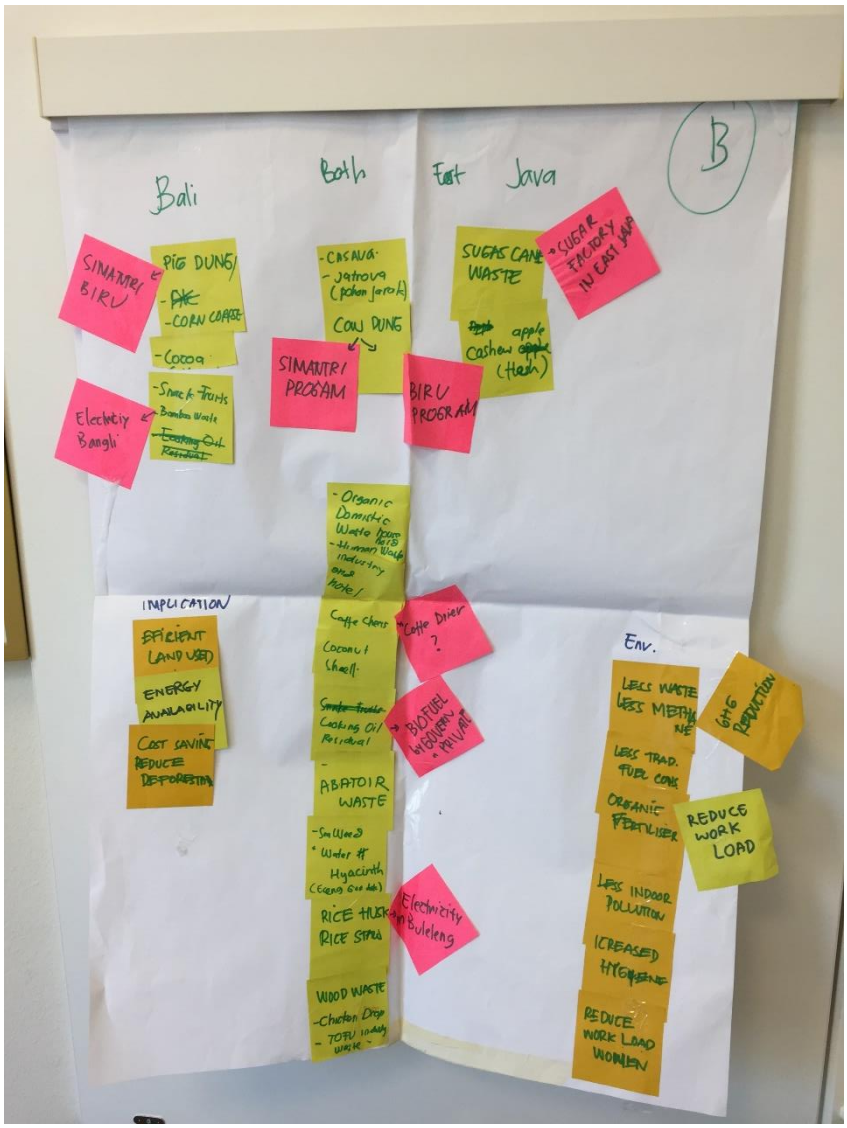
Annex 3: Group work summaries

THURSDAY, 12 MAY 2016

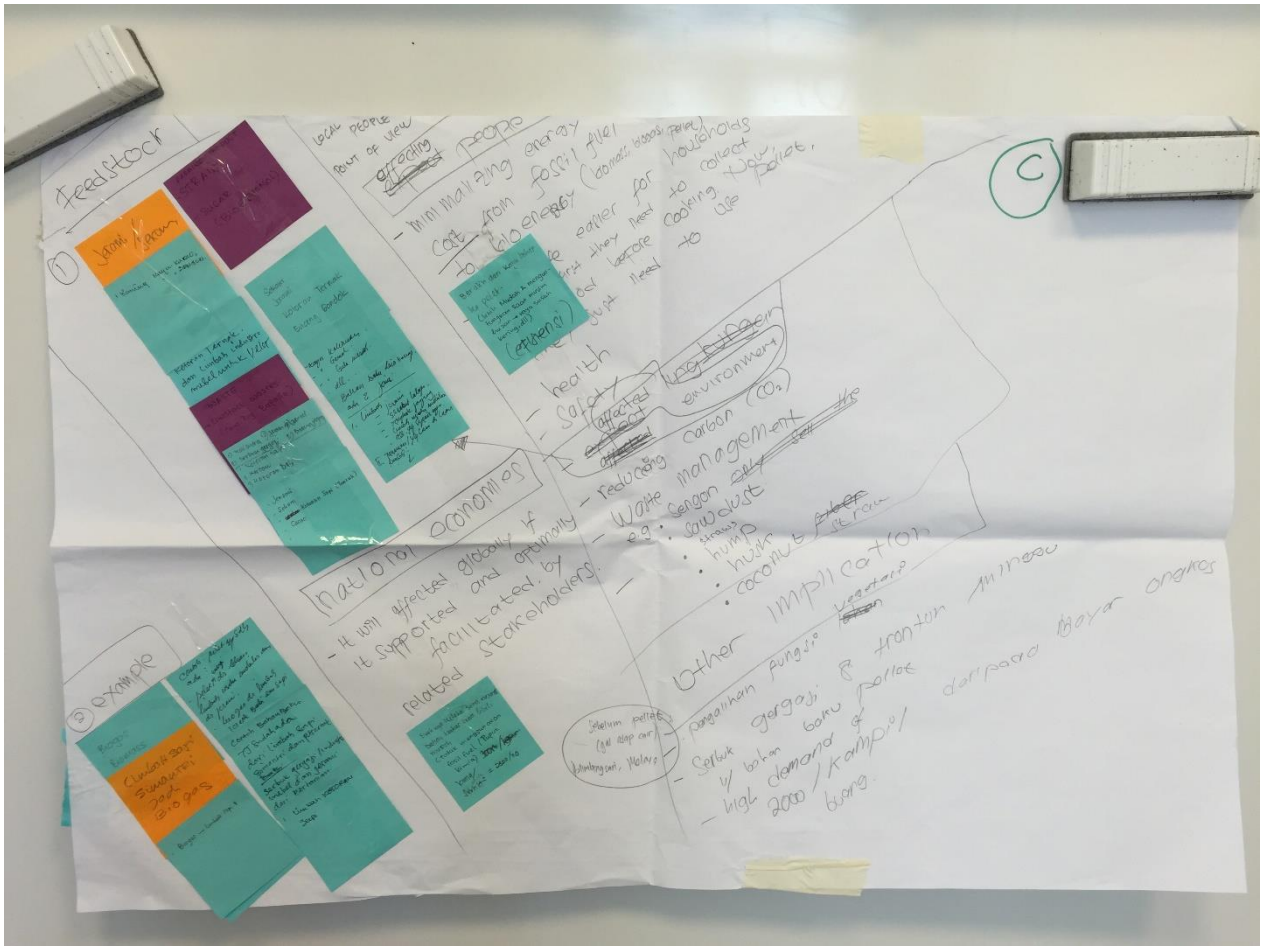
Group A



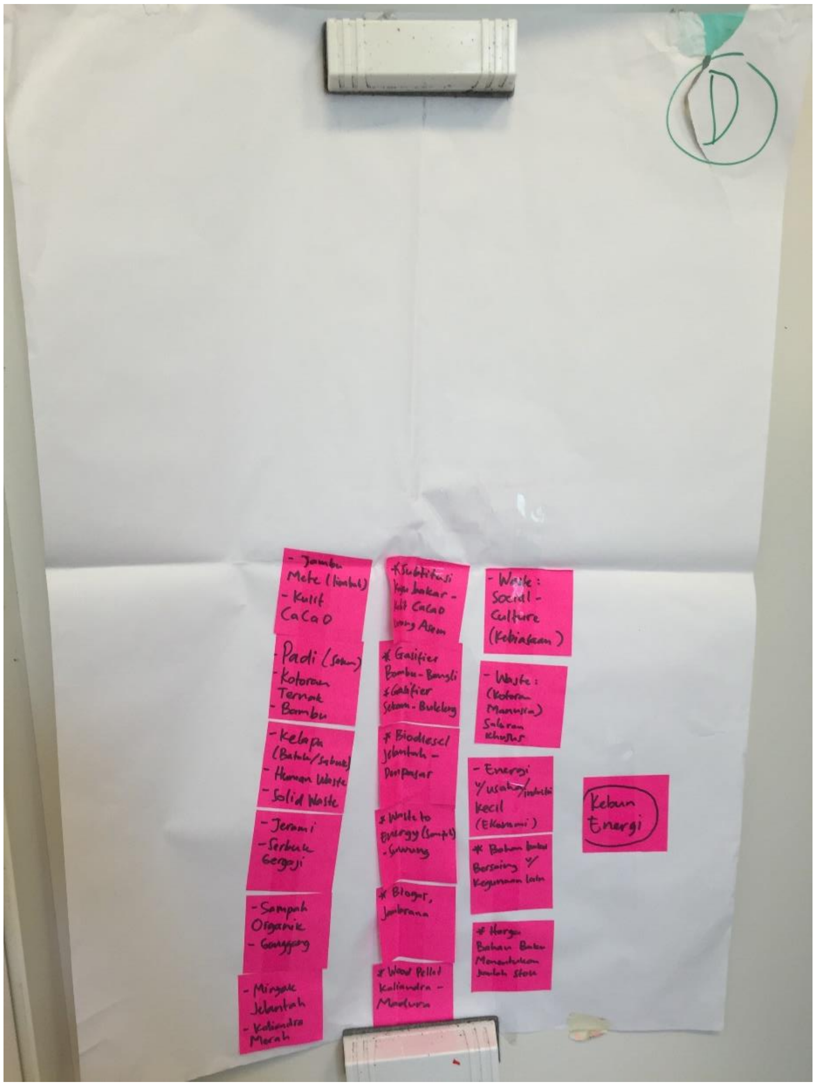
Group B


B
Bali
Both
East Java
SIMANTRI BIRU
PIG DUNG
- CORN COBBS
- Cocoa
Electricity Bangli
- CASAVA
- Jatropa (Pohon Jarak)
COW DUNG
SIMANTRI PROGAM
BIRU PROGRAM
SUGAS CANE WASTE
SUGAR FACTORY IN EAST JAVA
Cashew (Hash)
- Organic Domestic Waste
IMPLICATION
EFFICIENT LAND USED
ENERGY AVAILABILITY
COST SAVING
REDUCE DEFORESTATION
Coffe Dryer ?
Coconut Shell
BIOFUEL
ABATOIR WASTE
RICE HUSK
RICE STRAW
WOOD WASTE
Electricity Buleleng
Env.
LESS WASTE
LESS TRAD. FUEL COST
ORGANIC FERTILISER
LESS INDOOR POLLUTION
REDUCE WORK LOAD
GHG REDUCTION
REDUCE WORK LOAD WOMEN

Group C

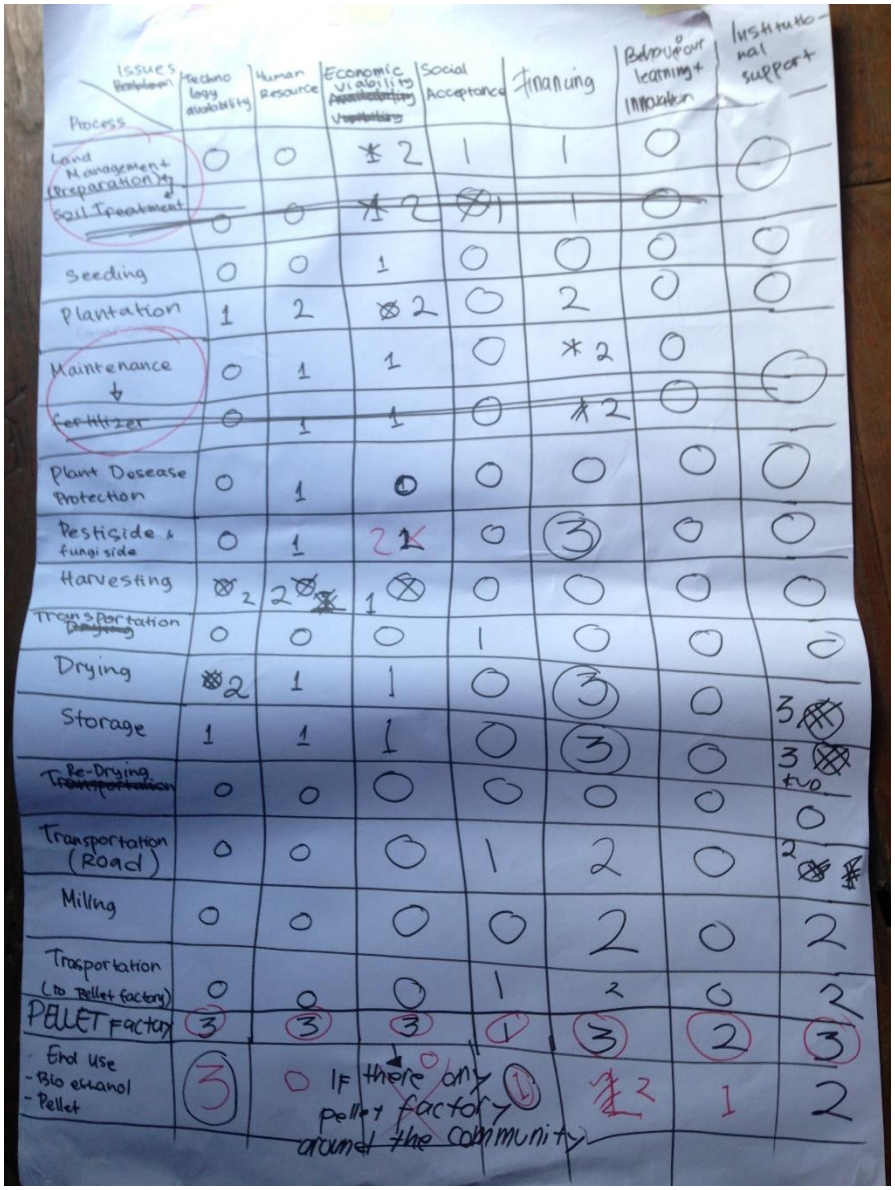

feedstock
people
economics
example
other implication
related
C

Group D


D
- Jambu Mete
- Kulit CaCaO
Padi
- Kotoran Ternak
- Bambu
- Kelapa
- Human Waste
- Solid Waste
- Jerami
- Serbuk Gergaji
- Sampah Organik
- Minyak Jelantah
* Gasifier
* Biodiesel Jelantah - Denpasar
* Waste to Energy
* Biogas, Jembrana
* Wood Pellet Kaliandra - Madura
- Waste : Social - Culture (Kebiasaan)
- Waste : (Kotoran Manusia) Saluran Khusus
- Energi
kecil (Ekonomi)
Kebun Energi

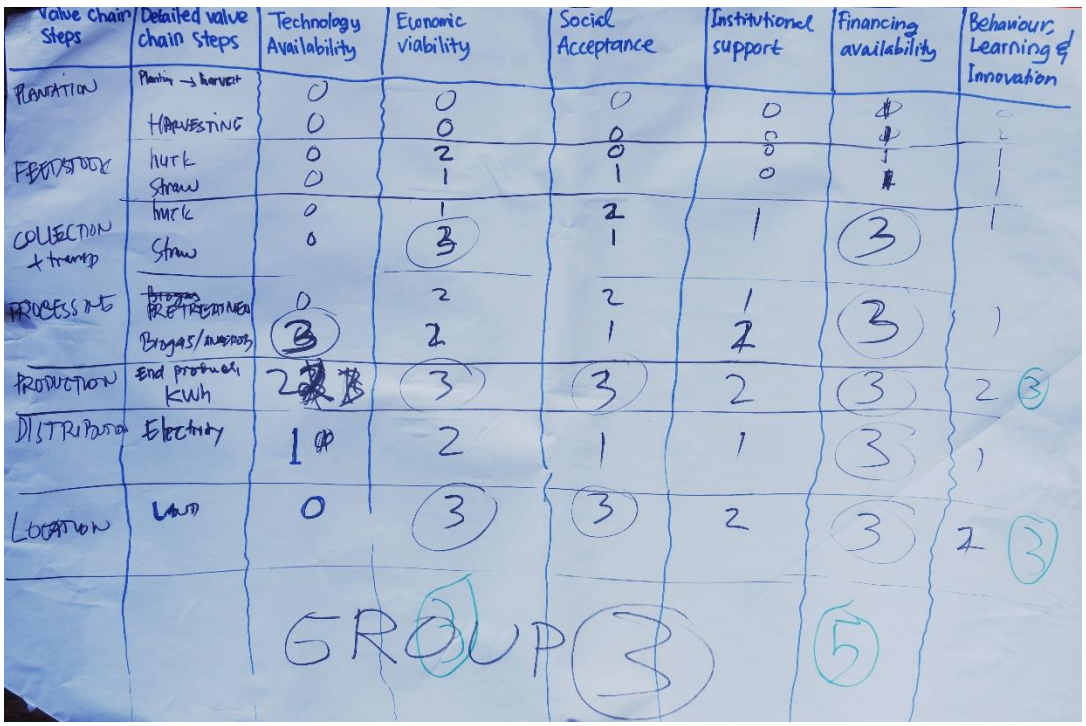
FRIDAY 13 MAY 2016

GROUP 1– RICE TO BIOMASS AND WOOD PELLETS

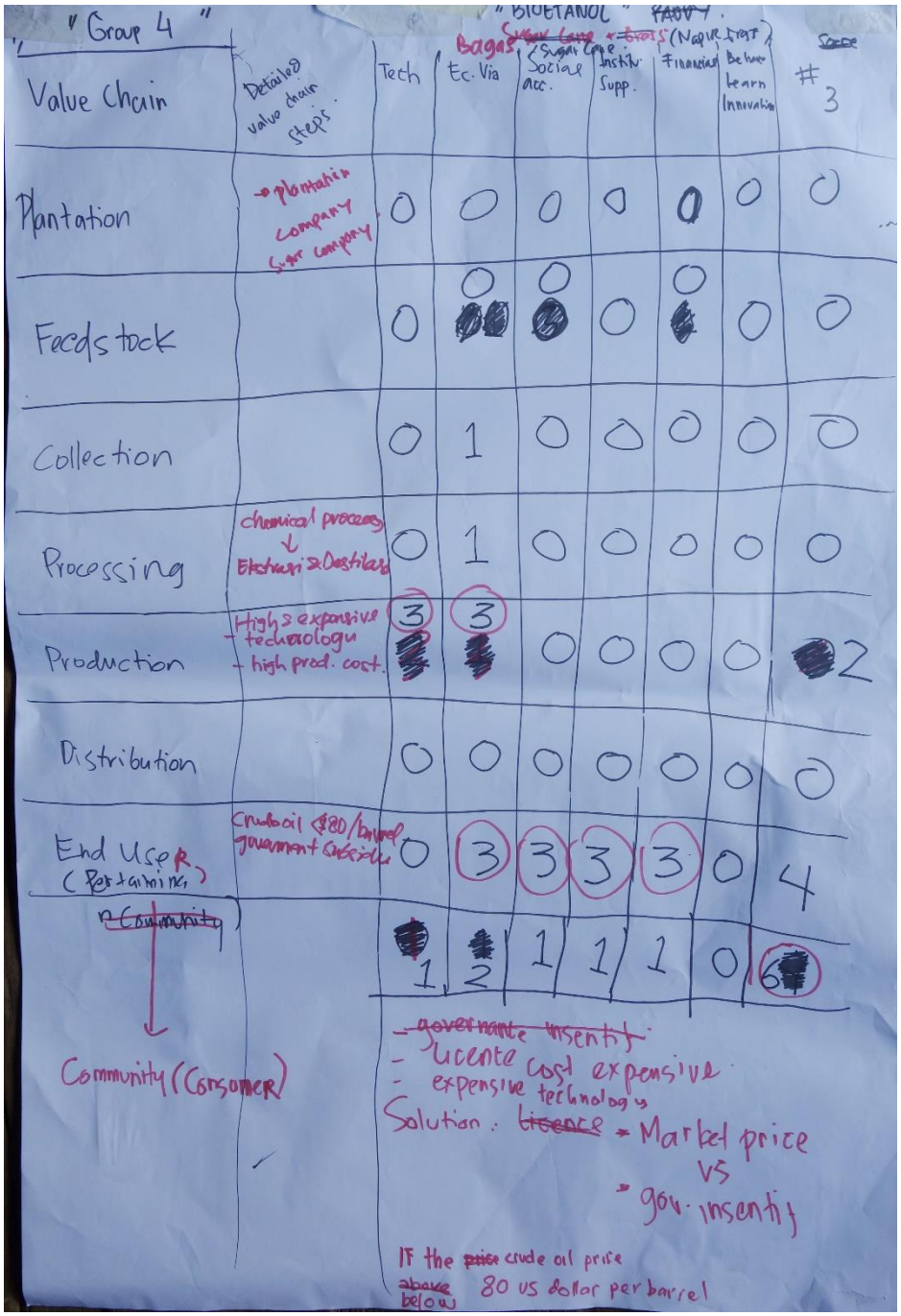


GROUP 2 SMALL SCALE, RICE STRAWS AND HUSKS TO BIOGAS

GROUP 3 - LARGE SCALE, RICE STRAWS AND HUSKS TO BIOGAS



GROUP 4 - RICE RESIDUES (BAGASSE, A SUGARCANE RESIDUAL AND NAPIER GRASS) TO BIOETHANOL



ALL GROUP FINDINGS