



Seventh framework programme
Food, Agriculture and Fisheries, and Biotechnology

Specific International Co-operation Actions
Small or medium scale focused research project



Sweet Sorghum an alternative energy Crop



SWEETFUEL / Grant Agreement n° 227422

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Final report on Ethics

Marcel Bursztyn – consultant for ethical issues
July , 2014

Composition of the consortium

CIRAD
ICRISAT
EMBRAPA
KWS
IFEU
UniBO
UCSC
ARC-GCI
UANL
WIP



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Food, Agriculture and Fisheries, and Biotechnology
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Ethical Appraisal

Prof. M. BURSZTYN
(Consultant for Ethics)

This report analyses the evolution of the consideration of ethical issues as part of the development of Sweetfuel Project (SFP), from the kickoff (in Montpellier) to the final meeting (in Hyderabad). It aims to be added to the final documents to be presented by the Consortium and is addressed to those in charge of follow-up and evaluation of SFP within the European Commission.

Preamble

The importance of ethics as an issue to be considered in research projects is a growing concern among financing agencies. Ethics committees are now part of the institutional framework of the most important academic and non-academic research institutions. This means that together with the definition and implementation of projects their implications must be considered. Moreover researchers are facing the need to submit their activities to the evaluation and compliance to ethical and deontological regulations. Their responsibility now is not only reaching the results proposed in the projects, but also foreseeing the consequences and preventing negative side effects.

There is an overall consensus among researchers that such considerations are necessary. But there is also a tendency to consider them as applicable to “others” rather than to oneself. Hence, ethics raises a typical NIMBY reaction: *not in my backyard*.

Ethical issues in the Sweetfuel Project

The inclusion of ethical issues in the Sweetfuel Project as an activity independent from the research Consortium was a demand from the EC after the approval of SFP. However, the invitation of the consultant to fulfil this role was made by the leading institution, the Cirad.

Since the kickoff of the project there was no interaction between the ethical consultant and the EC. No guidelines have been proposed. No follow-up and no feedback took place. The discussions and reports were transmitted by the coordination of the project to the EC without any direct interaction whatsoever between the ethical consultant and the financing board.

Ethical Issues and biofuels

Some of the usual ethical questions related to biofuels in general are:

- Food vs. Fuel vs. feed
- Disruptions in peasants' economy and ways of life (food for self consumption, adaptation to market rules, increase in the use of technology and agrochemicals)
- Environmental impacts, such as increase in deforestation

- Informed consent (risk of uninformed use of local/indigenous knowledge for the purpose of profit)

Questions associated to research, in general

Some questions associated to research in general were also treated, such as:

- Plagiarism and data falsification
- Accomplishment of national regulation (bio-piracy, quarantine)
- Accomplishment of basic human rights (decent work, child work)
- Sharing of authorship (joint publications)
- Patent registration, propriety rights, sharing of benefits (compliance with the Nagoya Protocol)

Case studies

Apart from the interaction and survey on the views of the members of the Consortium, two Case studies were previously set by the SFP: India & Brazil.

In both cases research was already being carried on previous to SFP and both had their own collection of material to be developed.

- Brazil – Embrapa
- India - Icrisat

Nevertheless their realities are rather different.

Some aspects raised in the visit to both institutions deserve being highlighted:

- In India, sweet sorghum (SS) is very disseminated among farmers; in Brazil sorghum is a known crop, complementary to other crops (such as maize), but for feeding cattle (grains).
- In India, SS is produced in small scale by small holders; in Brazil, the target of Embrapa are large scale sugar cane farmers.
- In India the use of ethanol blended with gasoline is recent and still small. A governmental recommendation from 2012 set the rate of 5%, but this rate is still to be reached.
- In Brazil ethanol (from sugar cane) is a national policy since the 1970s, both for the supply of ethanol vehicles and to blend with gasoline (25%). Since 2013 all cars made in Brazil for the national market are *flex-fuel*.
- In India the “risks” of disruption for the peasants’ economy are to be considered, as they must manage trade-offs between self-consumption and market strategies; in Brazil this is not a risk, but rather an opportunity, as SS is meant to be complementary to sugar cane in large scale farms. But there are risks associated to the increase in the production of sugar cane in Brazil, as is the case of deforestation. One can consider that the introduction of SS may slow the pressure on forests.
- Both Icrisat and Embrapa don’t aim at making profit from the outcomes of their research.

Perceptions of members of the consortium: Survey

In two previous occasions all members of the consortium have been consulted about their perceptions and opinions about ethical implications of their activities.

The number of responses was quite small, but the opinions expressed revealed important aspects.

For the finalization of the project’s activities, and aiming at providing the EC with information and even a methodological feedback for further initiatives, a set of questions has been proposed, as a wrapping-up procedure. A questionnaire containing issues related to the procedures, outcomes and final remarks was sent to those who have participated in the Consortium. The main goal was to compare their initial views and expected impacts, from the ethical point of view, to those in the finalisation of the process. The number of responses was higher than in the previous surveys: 24.

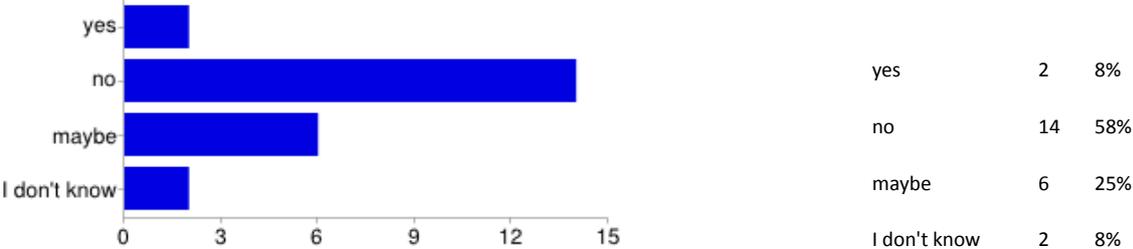
As a general comment, to most of the questions the overall views do not reveal more doubts or worries now than in the beginning. In addition, the amount of responses “I don’t know” has diminished considerably, showing a higher degree of clarification about the issues raised. However, there are still some aspects that can’t be considered as free of doubts. This is the case of: *The relation between the Sweetfuel Project and problems with the sharing of results* (42% of yes and maybe in the beginning and 52% now).

The summary presented bellow shows the results of the survey (Jan/Feb 2014).

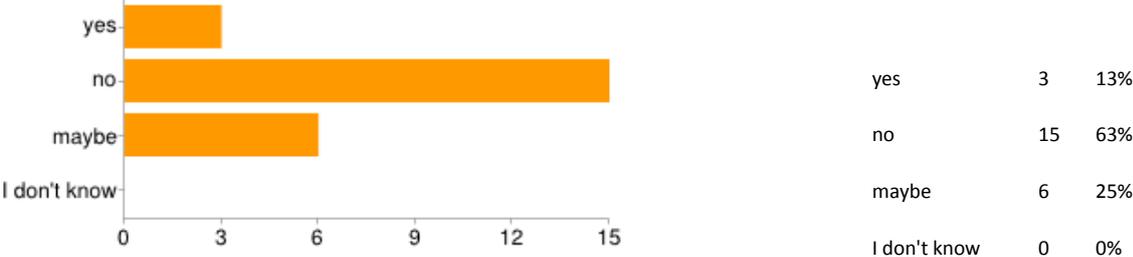
Summary (24 responses)

Please inform your views on the following questions, in the moment of the beginning of the Sweetfuel activities, and now.

1. In the beginning of the Sweetfuel activities: [1. The relation between the Sweetfuel Project and food safety risks?]



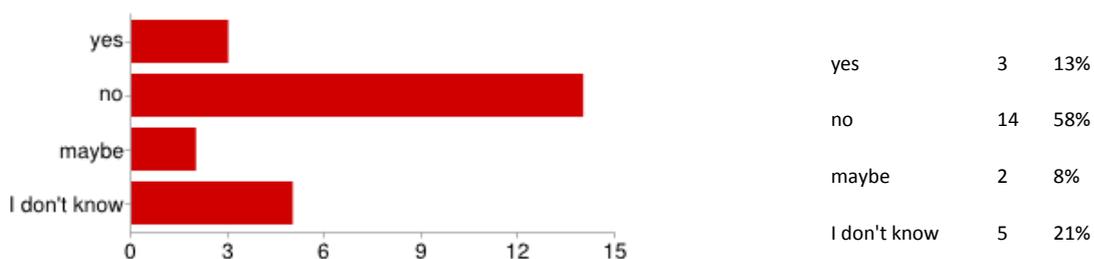
Now: [1. The relation between the Sweetfuel Project and food safety risks?]



If you have checked "yes" or "maybe", describe briefly:

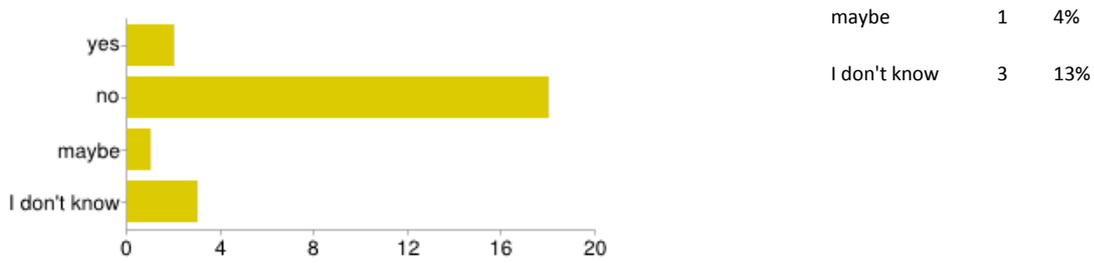
During the project it became evident that the dual purpose crop sweet sorghum may in fact be used as single purpose crop (i.e. no use of the panicle) due to economical reasons. This may have impacts on food security, even though rather unlikely in the present situation. there is always a food vs. fuel issue when growing fuel crops Since sweet sorghum often produces less grains than grain sorghum, there might be a trade-off food vs. fuel. it seems that there is a low direct competition as the plant combines food and fuel, but a sweet variety does not produce as much grain as a grain variety. In the case of Brazil, the competition exists because the grains are not harvested by sugar cane industrials. In that case there is a competition between sweet sorghum and a grain legume (bean, peanut...) Big companies interested in biofuels may have the resources to grow sweet sorghum in good environments to increase productivity. This can decrease the area to grow crops to produce food. To my knowledge and understanding, the multiple use targets (food-feed-fodder) of the breeding programme seem still under research, thus more difficult to achieve as initially thought. I might misunderstand the statement associated to the answer. That's why am fulfilling this box: According to my understanding there is not food safety risks in relation to the Sweetfuel Project ICRISAT bred sweet sorghum varieties yield both grain yield (> 3 t/ha) and stalk sugar yield (>2 t/ha). Hence no trade off. Only ± 4% non used arrable land available for biofuels. Some productive soil might be used for enough biomass production for biofuels. Productive solid presently used for food production. The yield of cereal obtained by the seed are lower than expected in farmer condition in Africa. The Sweetfuel Project investigates the use of sweet sorghum, which has traditionally been used for food purposes, as a potential energy crop for biofuel production.

2. In the beginning of the Sweetfuel activities: [2. The relation between the Sweetfuel Project and bio-safety risks?]



Now: [2. The relation between the Sweetfuel Project and bio-safety risks?]

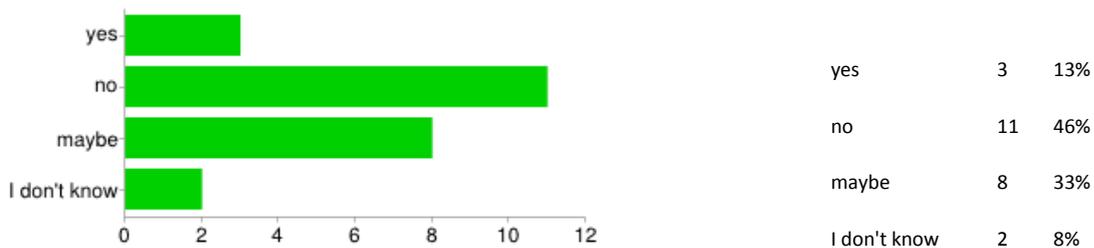
yes	2	8%
no	18	75%



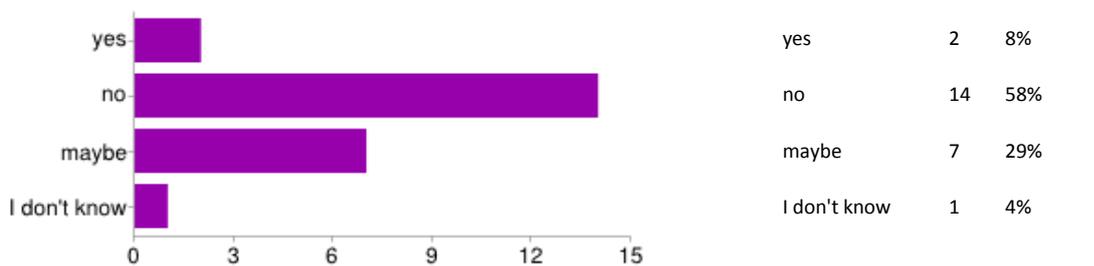
If you have checked "yes" or "maybe", describe briefly:

As sorghum is considered as a plant less sensitive to pests (compared to corn) and thus less demanding in chemical treatment, the risk is reduced. No GMO work. To my understanding, this Project aim to reduce environmental contamination and its activities do not constitute any biosafety risks. Biofuels will be produced under Conservation Agriculture principles which will reduce bio-safety risks.

3. In the beginning of the Sweetfuel activities: [3. The relation between the Sweetfuel Project and risks of environmental damage?]



Now: [3. The relation between the Sweetfuel Project and risks of environmental damage?]

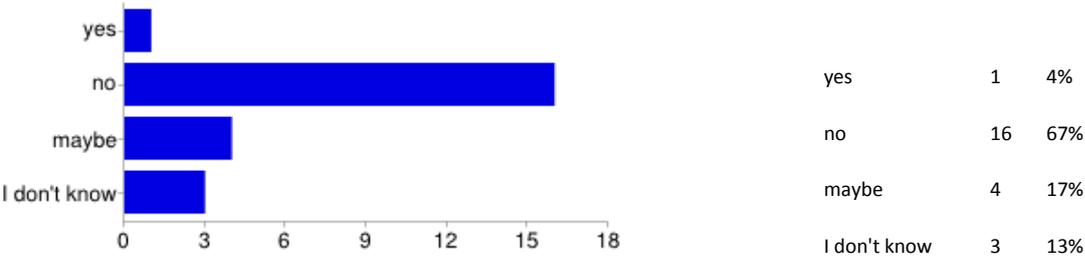


If you have checked "yes" or "maybe", describe briefly:

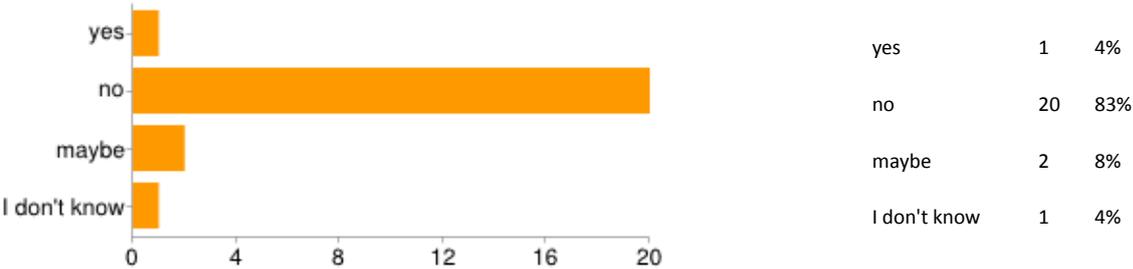
Biofuels will be produced under Conservation Agriculture principles which will reduce environmental damage. The issues of land use and water use for feed stock production and water consumption and waste recycling during processing are to be fully researched and understood. Continuous cropping of Sweet Sorghum may lead

to soil erosion and fertility mining of appropriate actions are not followed, such as no-till planting and soil fertility maintenance to avoid nutrient mining. there is always environmental risks if agriculture is involved because not all farmers apply best possible agricultural practices Disposal of some secondary products during the sweet sorghum processing plant, must be safe to the environment. There is NO risks of environmental damage in relation to this Project . On the contrary, the results of this project will contribute to avoid or decrease environmental damage the risk on environment exists if we supposed that a deforestation will be necessary to plant sorghum... but on the other side, sorghum can grow and produce on poor lands where other crops would not be able to produce anything... Chemical abuse for weed control is still a risk, particularly in our concerned area, the Sahel, where Striga remains the main threat. Long lasting herbicide abuse leads to soil deterioration, For Sahelian countries, this environmental risk may be still here, until alternative solutions against Striga is found. Environmental damage may occur for any crop cultivated in very large plantations. The project has not achieved complete knowledge about the risk about environmental change. At the beginning, a great deal of uncertainty existed on the possible expansion of sweet sugar crops for fuel Now, it looks clear that, if possible at all, it will be marginal.

4. In the beginning of the Sweetfuel activities: [4. The relation between the Sweetfuel Project and social risks?]



Now: [4. The relation between the Sweetfuel Project and social risks?]

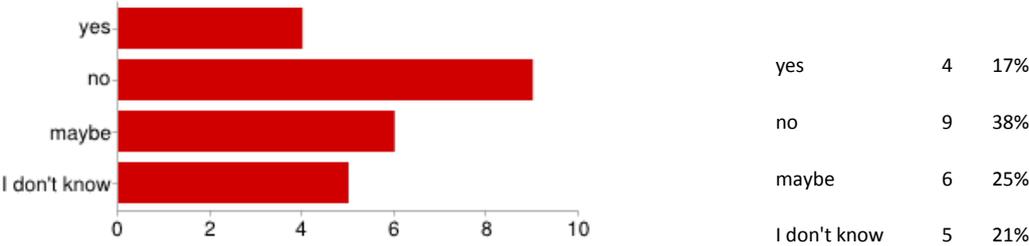


If you have checked "yes" or "maybe", describe briefly:

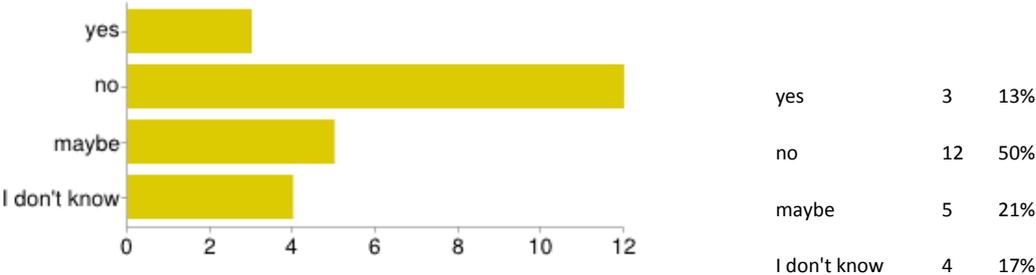
It seems to me that the development of sweet sorghum should give alternative opportunity to farmers to diversify their production and give them added incomes. Sweet sorghum is not only for ethanol production, it can also provide good forage (through bagasses) and grain... these products can be included in a new value chain for feeding animals (new value chain) which could create new jobs In a centralized production unit (big

production plants) surrounding production areas must be high mechanized to be economically viable. Therefore, low labor demand will exist in these areas. Social impacts crucially depend e.g. on the scale of sweet sorghum cultivation. It currently seems that large scale industrial applications are more likely to happen in the short term (in Brazil) However, positive social impacts are foreseen e.g. in Haiti and the Philippines. there is always social risks involved, especially in developing countries, when investors look for (cheap) land to grow biofuel crops.

5. In the beginning of the Sweetfuel activities: [5. Do you see any relation between the Sweetfuel Project and economic risks?]



Now: [5. Do you see any relation between the Sweetfuel Project and economic risks?]

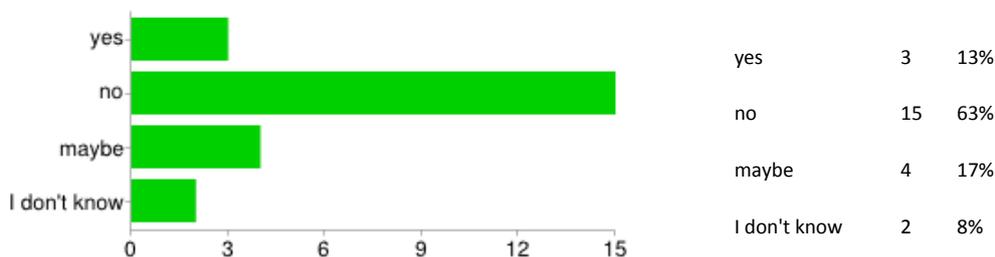


If you have checked "yes" or "maybe", describe briefly:

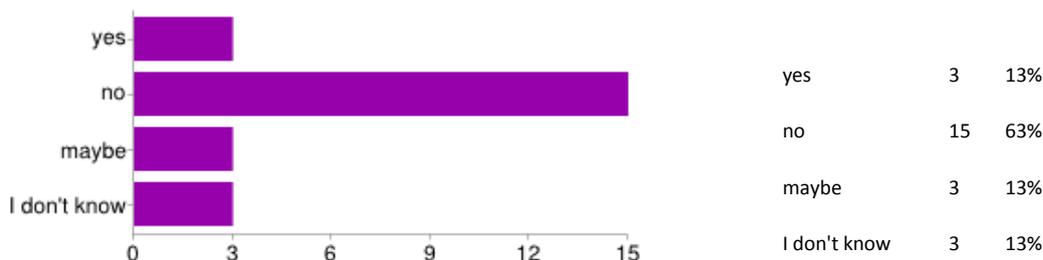
At the beginning the costs does not (might not) compensate benefits, depending on private or multinational interest, energy situation of specif country, type of government, needs, etc. It is matter to look for an equilibrium between specific interests environmental needs, futur decrease of hydrocarbures, status of reserves, etc. However it is necessary more research in this type of technology in order to be more efficient. For small farmers the risk is low, because different options are available to valorize sweet sorghum production: grain can be consumed (human or animal), stalks can be consumed (animal) or burned to produce energy, and the sweet juice can be used to produce ethanol or syrup... there are different options and the farmer can chose the best according market price of ethanol, forage, syrup etc... Same reasons as above. Impact will be very small, if any. In Mexico, PEMEX is the only company that is approved by the goverment to sell biofuels in mixtures with fossil fuels, therefore the price imposed by PEMEX could be low to compensate the investment to produce bioethanol. The initial sweetfuel stages will have to be subsidised other wise this bio-ethanol

concept won't work in South Africa. If we don't have the right hybrids for planting, the grower has a high risk in loosing money The fact that yield of cereals per hectare is lower than expected can creat an economic risk. But farmers can sow others crops like peanut in the same hectare to complete the income per hectare. Large scale applications of sweet sorghum (complementing sugar cane growing) seem to be increasingly economically interesting. For small-scale applications, economic viability still needs to be demonstrated, or has not been achieved as e.g. in India.

6. In the beginning of the Sweetfuel activities: [6. The relation between the Sweetfuel Project and conflicts of interest?]



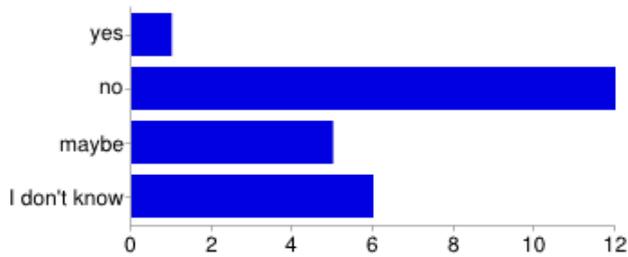
Now: [6. The relation between the Sweetfuel Project and conflicts of interest?]



If you have checked "yes" or "maybe", describe briefly:

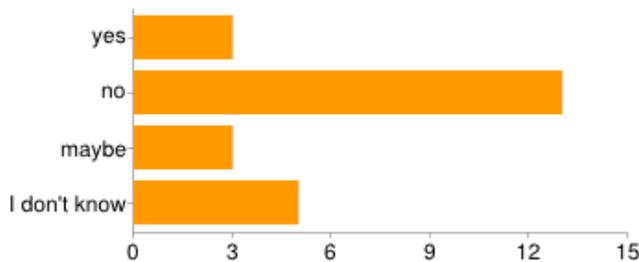
A conflict of interest will only develop when the income from biofuels will be higher than that of food production. Research results achieved in the project remain property of the "owning institution". Private organisations and state R&D centres will strive to create economic value from R&D results, and thus conflicts of interest may arise. food vs. fuel, social risks see above Private interests to maintain/increase oil dependence and prices..establishment.

7. In the beginning of the Sweetfuel activities: [7. The relation between the Sweetfuel Project and problems of informed consent?]



yes	1	4%
no	12	50%
maybe	5	21%
I don't know	6	25%

Now: [7. The relation between the Sweetfuel Project and problems of informed consent?]

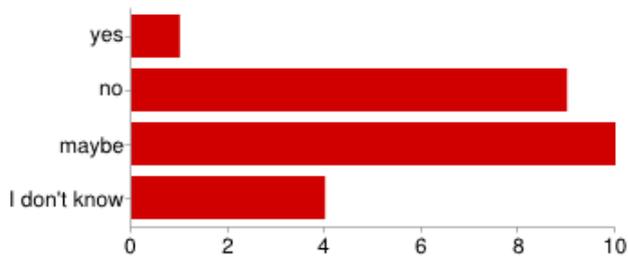


yes	3	13%
no	13	54%
maybe	3	13%
I don't know	5	21%

If you have checked "yes" or "maybe", describe briefly:

It is local cropping pattern and socio-economic status of the concerned farmer (s) dependent. The risk for indigenous people and small farmers need to be taken care of especially for e.g. ownership of genetic diversity in situ, land ownerships/grabbing, foreign investments, spoliation, ... I don't believe full knowledge of the risks involved given to local communities.

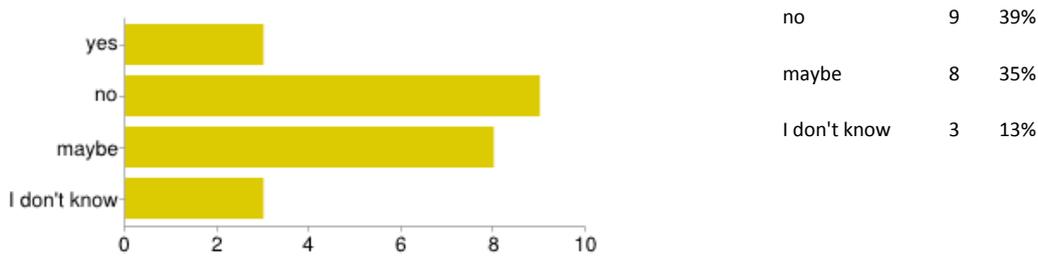
8. In the beginning of the Sweetfuel activities: [8. The relation between the Sweetfuel Project and problems with the sharing of results?]



yes	1	4%
no	9	38%
maybe	10	42%
I don't know	4	17%

Now: [8. The relation between the Sweetfuel Project and problems with the sharing of results?]

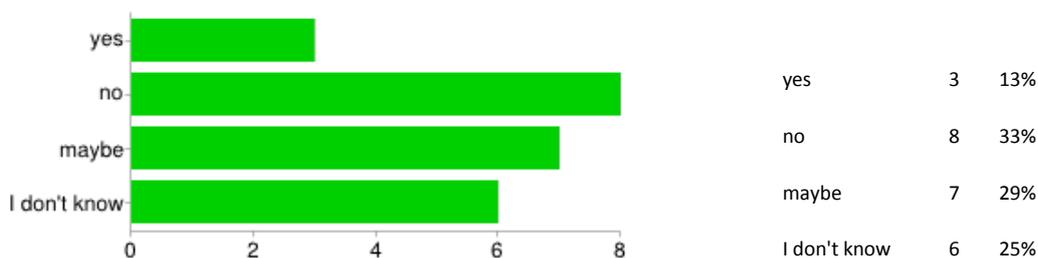
yes	3	13%
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If you have checked "yes" or "maybe", describe briefly:

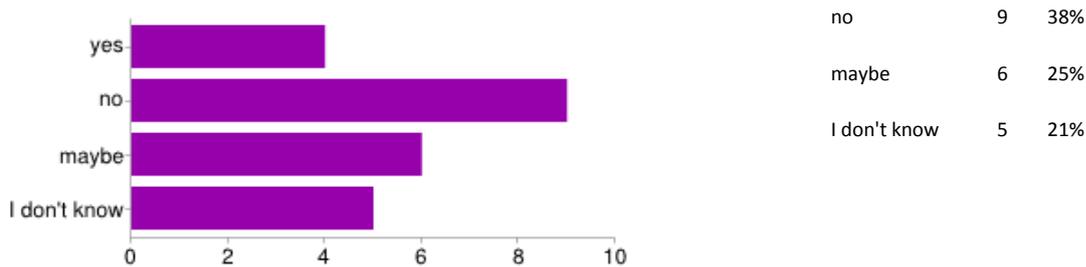
In my point of view, it seems very difficult 1) to list or to quantify all the knowledge specifically generated by the project and 2) to verify if the results of the project will be shared according to the agreement signed by all members of the consortium at the beginning of the project. In general ownership shall remain with the respective organisation, however conflicts may occur in joint research activities. To my knowledge this is not foreseen within SWEETFUEL. The more sorghum becomes a cash crop for non-food purposes, the more the breeding and biotechnologies advance, the project might not have totally taken into consideration the sharing of results. However, no patents were developed during the project. Further to this, the scientific public community around the world has gained benefit of the project which developed a well organized dissemination action plan. Some problems of sharing results might happen during the project, but they are not specific to the project...they are rather linked with some scientists who protect their know how and collected data. But it seems that these problems are secondary problems There is not capacity to perform activities which are aimed at caring and enforce patent rights due to the registration of the new varieties. ICRISAT could not send seeds currently outside the country as some issues with NBA needs to be resolved. Cultivars and genetic resources need to be made available to the user public, either through release to the public domain or through the release through the private seed sector. Some problem might be originated if some copyright/patent exist. However, can be solved and to arrive to an agreement among the parts specifically involved

9. In the beginning of the Sweetfuel activities: [9. The relation between the Sweetfuel Project and the sharing of benefits?]



Now: [9. The relation between the Sweetfuel Project and the sharing of benefits?]

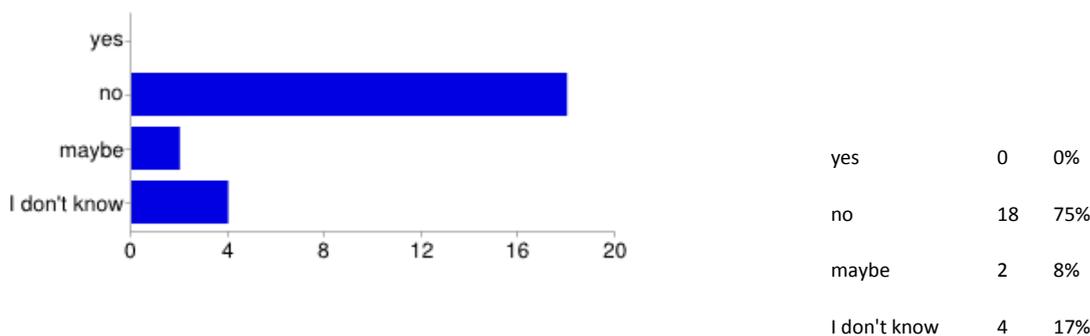
yes 4 17%



If you have checked "yes" or "maybe", describe briefly:

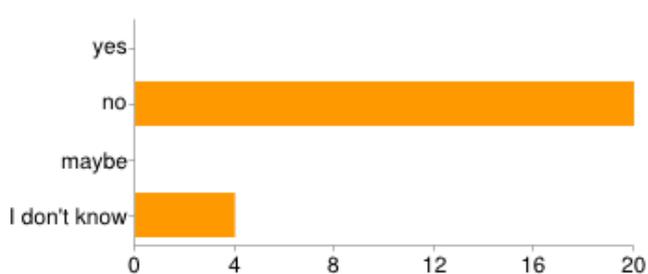
Globally all the results were shared, but in detail, it is less the case... But, we can wonder if it is quite necessary to share all the results: for example, a breeder looking for a low temperature adaptation and a biomass production will not be interested by a sweet sorghum adapted to tropical environment... All partners need to abide by the consortium agreement, which I believe is the actual case. Benefits of research should be shared. same opinion that I have expressed above For me, the material should be made available for all, via a Genbank like ICRISAT In general benefits shall remain with the respective organisation responsible for the R&D results, however conflicts may occur in joint research activities. To my knowledge this is not foreseen within SWEETFUEL. As above, how can it be assured, that all relevant stakeholders will receive the information worldwide ? Few sharing of new knowledge between the participants of the project. there is potential economic bonus of the scientific outcomes of the Sweetfuel project, but these aspects were not totally taken care of. This would have needed a specific task included in the project as a full activity instead of a "political" activity at the fence of the project.

10. In the beginning of the Sweetfuel activities: [10. The relation between the Sweetfuel Project and problems of authorship of publications?]



Now: [10. The relation between the Sweetfuel Project and problems of authorship of publications?]

yes	0	0%
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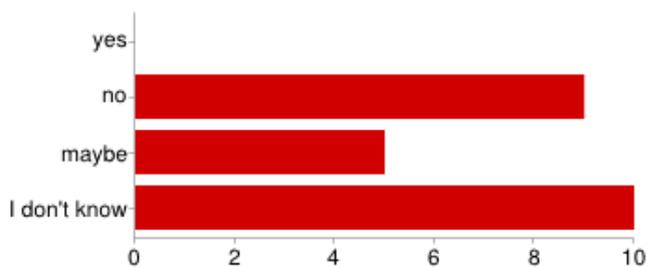


no	20	83%
maybe	0	0%
I don't know	4	17%

If you have checked "yes" or "maybe", describe briefly:

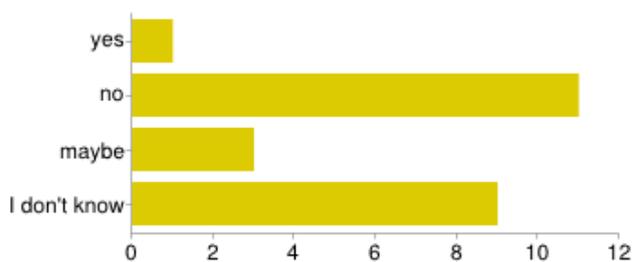
All partners need to abide by the consortium agreement, which I believe is the actual case.

11. In the beginning of the Sweetfuel activities: [11. The relation between the Sweetfuel Project and problems in addressing specific national regulations?]



yes	0	0%
no	9	38%
maybe	5	21%
I don't know	10	42%

Now: [11. The relation between the Sweetfuel Project and problems in addressing specific national regulations?]



yes	1	4%
no	11	46%
maybe	3	13%
I don't know	9	38%

If you have checked "yes" or "maybe", describe briefly:

National policy changes frequently, like which crop to use for biofuel production, and even in case of sorghum stalk or grain is an issue. Without having had the occasion to evidence this, my idea is that national regulations may have hindered a smooth development of the project activities. Depend on specific situation and politics of each government. Results - if strong- should serve as the basement to address specific national regulations,. The exchange of germplasm. Some specific national regulations resulted and will result in problems. Seed exchanges were very difficult to complete in the project and it seems in the future that it will be worst, for example in India where now it is closed to impossible to get any seed from Icrisat due to new Indian regulations. In that case, Icrisat will not be able to continue his mandate to be the world reference centre for genetic resources of sorghum.