**Module #7**

**Activity 7**

**Role play: Prioritising measures**

**Duration: 60’** (of which 30’ group work and 30’ role play)

**Objectives**

Discuss, from the point of view of different actors, the advantages and disadvantages of different policy measures, prioritising them according to sectoral, environmental and climate change adaptation/mitigation criteria.

**Instructions[[1]](#footnote-1)**

Each group is assigned one of the following roles: (1) Ministry of Agriculture; (2) Newland Environmental Protection Agency; (3) Ministry of Health; (4) Sugar Producers Association; and (5) Newland Cane Cutters Association (NCCA). These actors are part of a Sugar Committee that is designing Newland’s Sugar Adaptation Strategy (NSAS).

You have to prepare for the next Sugar Committee meeting, where a limited number of NSAS aspects will be discussed. As part of your preparation for this meeting you have to have a clear idea as to the best alternative measures that should be integrated into the NSAS, taking into account the prioritisation criteria that were previously defined in the context of the Sugar Committee, but also taking into account the challenges and opportunities faced by your sector.

All groups are given:

* A general text on the context of the development strategy they are engaged in designing;
* A list of priority measures and alternatives that are being put forward for discussion in the forthcoming meeting;
* A list of prioritisation criteria that was prepared in the early stages of the strategy development process;
* Indications of the objectives for your organisation, as well as some information that may be only your organisation possesses.

**General context to the Newland Sugar Adaptation Strategy**

One of the most important economic sectors in Newland is the production of sugar, which had been sold in large part to the European Union at a preferential price under the EU-ACP Sugar Regime. However, recently the EU has announced that, due to a WTO ruling, they will now purchase sugar at a price around 32% lower. This will result in important economic difficulties for Newland’s economy in general, and for its sugar sector in particular. Nevertheless, the EU will provide financial support to the implementation of a “national sugar sector adaptation strategy”, in order to better adapt to the new economic circumstances.

As Newland is classified as a Least Developed Country (LDC), it can benefit from the EU’s ‘everything-but-arms’ initiative, meaning that it will be able to export an unlimited amount of sugar tax-free to the EU, giving it a competitive advantage over other sugar-producing countries in the region. However, the sugar industry is Newland is highly inefficient, its crop yields are low, and it is increasingly experiencing rainfall shortages due to climate change, a rather unfavourable situation as most sugar cane fields are rain-fed, and sugar cane being a ‘thirsty’ crop.

Newland is currently starting its national environmental and climate change mainstreaming programme. As a result of this, the Newland Sugar Adaptation Strategy (NSAS), although led by the Ministry of Agriculture, is being discussed by a multi-sector Committee, which includes, *inter alia*, the Ministry of Environment and the Ministry of Health.

The general points agreed for the adaptation of the sugar sector include:

* Increased production of sugar
* Increased productivity of the sugar production industry
* Diversification, including bioethanol production and ‘specialty’ sugars aimed at the European market

For the forthcoming meeting the following measures will be discussed:

**1. Production of bioethanol**

There is a growing market for bioethanol in the region and world-wide, triggered mainly by the high and highly fluctuating price of oil, as well as by the international pressure to move towards the use of cleaner and renewable fuels.

Molasses, a by-product of the sugar production process, are currently being sold for animal feedstock in the region. A small amount is also sprayed in the sugar estate roads to keep down dust levels. However, molasses can also be used to produce bioethanol, which has a much higher market value. Newland is a country that has no distilling industry at present, and its development of the bioethanol industry would be the first.

A recent Strategic Environmental Assessment (SEA) pointed out the environmental risks of the bioethanol industry, the main one being that one of the processes’ by-products is vinasse, a highly polluting substance due to its very large concentration of organic matter. To give an idea, the Biological Oxygen Demand (BOD)[[2]](#footnote-2) of unpolluted waters should normally be below 5 mg/l, raw sewage ranges from 150 to 300 mg/l, whilst vinasse could reach BOD values of around 17,000-50,000 mg/l. Not only is the extremely high organic load of vinasse a concern, but the fact that vinasse is produced in very large quantities: for each litre of ethanol, around 10-15 litres of vinasse are produced. Moreover, under climate change water flows in rivers are expected to decrease, meaning that any contaminant ending up in the river will end up more concentrated due to lower dilution.

The following alternatives are being discussed for the management of vinasse:

* Installing a bio-digestor (anaerobic digestion) which would greatly reduce the organic load and generate methane that can be burnt to produce electricity.
* Using the vinasse for ‘fertigation’; i.e. using it to irrigate the sugar cane fields.

The following key issues have also been highlighted in the SEA:

* Newland has a very weak regulatory framework for water pollution control; for example, there are no official water quality standards.
* Newland’s Environmental Protection Agency (NEPA) is a weak institution; its capacities for enforcement are very limited.
* There is an Environmental Impact Assessment (EIA) system in place, which mandates an EIA for all major industrial development projects, and which must be accompanied by an Environmental Management Plan (EMP). However EMPs are often not implemented, and NEPA’s capacities are not sufficient to guarantee enforcement.

*Alternative 1: Anaerobic digestion (bio-digestion)*

An anaerobic digestor would greatly reduce the organic load of the vinasse, bringing it down to around 9,000 mg/l according to preliminary estimates. On the other hand, the methane (CH4) that it generates (about 20 m3 CH4 per 1 m3 of molasses) would produce around 10.75 kW-h per each 1000 litres of ethanol produced. This energy, together with the energy produced from the burning of bagasse, is sufficient to satisfy the sugar processing plant and refinery, and could even produce a surplus that could be sold to the national power grid or provided to the local community.

As the main source of energy in Newland is coal, the energy generated from the vinasse anaerobic digestion process would help reduce GHG emissions, and could even qualify for ‘carbon credits’ under the CDM scheme. Although this possibility is to be explored, there is at least one precedent of such a CDM project in Nicaragua.

One potential obstacle identified in the SEA is that the price of electricity for industry is heavily subsidised (part of a government’s programme to promote industrial development and foreign investment). Unfortunately the Ministry of Energy is not represented in the sugar reform committee.

The major drawback of the biodigestor option is its high cost. On a preliminary calculation, the biodigestor required could cost around 10 million $USD, and its operational and maintenance cost could also be significant.

*Alternative 2: use of vinasse for fertigation*

Due to its very high organic content, vinasse can be applied directly to the sugar cane fields as fertiliser. It is high in nitrogen (N) and potassium (K) (around 550 mg/l of N and 1400 mg/l K2O), although not particularly rich in phosphorous (P) (only about 17 mg/l P2O5).

Application of vinasse could substitute the use of inorganic fertiliser to a large extent, which would also save in the cost of such fertilisers equivalent to about 400 $USD/ha/year. In terms of GHG emissions, this option would also reduce the GHG emissions associated to fertiliser production.

**2. Efficient cane harvesting**

Up to now the sugar cane is burned before being manually harvested. Hand-cut Burnt Cane Harvesting (BCH) has various advantages, including a faster cutting rate than Green Cane Harvesting (GCH).

The Government of Newland is giving serious thoughts to making cane harvesting more efficient. Initial proposal towards this end include retaining BCH, which is more efficient than GCH. This option is supported by the association of cane cutters, as BCH is a less arduous task than GCH, and they believe their income would be reduced if GCH is used.

However, the recently completed Strategic Environmental Assessment (SEA) has pointed out key aspects with regards to cane harvesting:

1. emission of persistent organic pollutants (POPs) associated to cane burning and compliance with the Stockholm Convention on POPs, and their associated potential health effects;
2. opportunities of green cane harvesting in a context of increased water scarcity expected under climate change;
3. employment issues associated to the harvesting method used (BCH/GCH).

The following table is reproduced from the SEA report and presents the advantages and disadvantages of GCH and BCH.

|  |  |
| --- | --- |
| **Advantages** | **Disadvantages** |
| **Burn Cane Harvesting (BCH)** | |
| * Faster cutting than GCH (1.5x) * Lower haulage costs (reduced trash content); greater payload in haulage vehicles * Fires chase out snakes in fields * Less extraneous matter (EM) levels than with GCH | * Emission of POPs * Nuisance from smoke, health effects * In intense fires, cracks in outer rind allow microbe entry, hastening post harvest deterioration and increasing dextran formation * Must be cut in less than 48h, juices dilute and no additional sugar formed * Increased kill-to-mill time in order to allow ash to cool, compared to GCH * Difficult to match quantity burned to availability of cutters and factory capacity * Volatilisation of N, S and C * Fire destroys beneficial micro-organisms and earthworms in surface layer * Reduced organic matter in soil, soil friability and porosity * Reduced capacity of soil to hold nutrients in root zone |
| **Green Cane Harvesting (GCH)** | |
| * Trash can be used for mulching: increases water retention, reduces irrigation water needs, partially contributes to climate change adaptation, weed suppression * If tops and trash used for co-generation: reduced carbon consumption, reduced emissions of GHG, energy efficiency, reduced dependency on import of energy, potential increased income for farmers * See disadvantages of BCH, which would also be advantages of GCH | * Slower harvesting if manual cutting used * More expensive haulage costs, lower payloads in haulage vehicles * More extraneous matter levels |

*Persistent Organic Pollutants (POPs)*

Newland has ratified the Stockholm Convention on POPs, and as part of its commitments has an obligation to produce a National Implementation Plan (NIP) spelling out a plan to reduce POPs and achieve compliance with the convention.

POPs constitute a class of organic compounds that are toxic, resist natural degradation, bio-accumulate and are transported through air, water and migratory species. They accumulate in the fatty tissues of living organisms and their concentrations increase higher in the food chain. Exposure to POPs has been associated with adverse health effects such as cancer, reproductive defects, immune system suppression, hormonal disruptions, etc.

Emissions of POPs are measured according to their Toxic Equivalent Quantity (TEQ). Newland’s POPs inventory identifies open combustion of waste as the main contributor of unintended generation of POPs (80%), and sugar cane burning stands out as the second source, accounting for 12% of emissions.

*Water scarcity*

The climate change projects for Newland include an overall decrease in rainfall and humidity, especially during the summer months, and thus adaptation measures such as irrigation and water retention are recommended under the NAPA. More specifically for the case of sugar cane, the NAPA and the SEA recommend the use of mulching: the use of tops and trash as ground cover increases humidity retention, as well as having additional advantages such as suppressing weed growth (and thus reduce use of herbicides). However if sugar cane is burnt prior to harvesting, mulching cannot be practiced.

*Employment*

Burnt cane harvesting (BCH) is about 1,5x faster than green cane harvesting (GCH), and thus required less labour. If mechanised harvesters are introduced, the effects of job options will dramatically decrease, a concern that has been pointed out in the context of the high levels of poverty in Newland.

Another issue to take into account is that cane cutters are currently paid a fixed amount per tonne of cane cut. As GCH is a more arduous and slow process, net income would be reduced if there is a shift from BCH to GCH. Labour unions have raised this issue and are pressing for cane cutters to be paid on an hourly basis.

**Prioritisation Criteria**

Criteria associated to objective was developed in the early stages of the sugar reform committee for the prioritisation of proposed measures. The measures being discussed in this committee meeting have to be prioritised according to these criteria.

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| --- | --- | --- | --- | --- |
| **Objective** | **Does not contribute to objective**  **(0 points)** | **Low contribution to objective**  **(1 point)** | **Contributes to objective but not significantly**  **(2 points)** | **Contributes significantly to objective**  **(3 points)** |
| 1. Increased competitiveness of the sugar industry (i.e. mainly reduced production and transport costs) |  |  |  |  |
| 1. Increased crop yields (i.e. increased tonnes sugar cane per ha) |  |  |  |  |
| 1. Increased generation of foreign exchange from sugar sector (i.e. increased exports) |  |  |  |  |
| 1. Creation of jobs |  |  |  |  |
| 1. Compliance with environmental regulations |  |  |  |  |

**References**

Conil, P (2012) *Bioetanol de caña. El desafío ambiental de las vinazas, pistas para Tucumán y future de la agroindustria*. Powerpoint presentation presented at the atalac-tecnicaña conference, Cali Colombia.

de Souza, S; Santos, R and Fracaro, G (2011) *Potential for the production of biogas in alcohol and sugar cane plants for use in urban buses in Brazil*. Paper presented at the World Renewable Energy Congress 2011, 8-13 May 2011, Linköping, Sweden.

Palerm, J. and Burgess, R (2009) *Strategic Environmental Assessment (SEA) of the Implementation of the Multi-annual Adaptation Strategy 2006-2015 of Jamaica*. Prepared by AGRECO for the European Union Delegation in Jamaica.

Palerm, J; Brown, R and Geerdts, P (2010) *Strategic Environmental Assessment of the National Adaptation Strategy to the EU Sugar Reform, Swaziland.* Prepared by GFA for the Restructuring and Diversification Management Unit (RDMU), Swaziland.

Palerm, J.; Sierevoge, T and Hichaambwa, M (2010) *Strategic Environmental Assessment (SEA) of the Sugar Sector in Zambia*. Prepared by AGRECO for the European Union Delegation in Zambia.

1. This case study is fictional but highly realistic. It is based on the findings of three Strategic Environmental Assessments (SEAs) of national sugar reform strategies of Zambia, Swaziland and Jamaica (Palerm and Burgess, 2009; Palerm, Sierevogel and Hichaambwa, 2010; and Palerm, Brown and Geerdts, 2010). Other references from which elements are taken include: Souza *et al*, 2011; Conil, 2012; and Cheesman, 2004. [↑](#footnote-ref-1)
2. Organic matter requires oxygen. BOD is a parameter that measures the amount of oxygen consumed by bacteria in the decomposition of organic matter, and thus is a common indicator of organic pollution. [↑](#footnote-ref-2)