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COMMITTEE ON COMMODITY PROBLEMS

JOINT MEETING OF THE FORTIETH SESSION OF THE INTERGOVERNMENTAL GROUP ON HARD FIBRES AND THE FORTY-SECOND SESSION OF THE INTERGOVERNMENTAL GROUP ON JUTE, KENAF AND ALLIED FIBRES

Beijing, the People's Republic of China, 22–24 October 2019

Trends and impact of the emerging anti-conventional plastic bags policy and rapid developments of biopolymers: opportunities and threats to JACKS products

Executive Summary

Increasing public concerns have emerged on the sustainability of plastic use and particularly its negative effects on the environment. While it is still early to assess the impact of policy shifts towards tighter regulations on plastic products, notably plastic bags, it is clear that the business-as-usual-scenario is no longer an option. The lack of sustainable and affordable alternatives to plastics remains a societal and economic challenge.

Bioplastic and JACKS-based products can offer a credible substitute to conventional plastics, including plastic bags, provided that value chain constraints are properly addressed. These include the relatively high per-unit production cost, the lack of supply reliability, and the issues of quality and generic product promotion.

Suggested action by the Joint Meeting

In considering whether scope exists for JACKS-based bags and bioplastics to enhance their competitiveness with respect to plastic products and plastics bags, in particular, the JM may wish to:

- Express its views on the opportunities for, and threats to JACKS products;
- Express its views regarding the appropriateness of undertaking internationally coordinated generic promotion activities to improve the visibility of JACKS products;

- Welcome the views of industry representatives to obtain appropriate guidance regarding opportunities and constraints relative to internationally coordinated generic promotion for JACKS;
- Consider serving as a technical advisory for projects proposed by Members and impact investors in the area of market diversification and sustainability of JACKS;
- Provide guidance regarding the need for further work on this topic. This would require the provision of the necessary qualitative and quantitative information to the Secretariat, particularly on production costs of various fibres, output prices and relevant national policies in place.

In order to facilitate its future deliberations on the topic, the JM may wish to add this item as part of the workplan of one of its Working Groups, with a view to elaborating the way forward.

I. INTRODUCTION

1. At the last Joint Meeting (JM) of the Intergovernmental Groups on Hard Fibres and on Jute, Kenaf and Allied Fibres (IGG/HFJU), delegates noted the importance of exploring possible alternative markets for jute, abaca, coir, kenaf and/or sisal (JACKS) products. In response to the Groups' request for further detailed studies, the Secretariat produced this document (CCP:HF/JU 19/2) examining the trends and impacts of the emerging anti-conventional plastic bags policy on JACKS.

2. The production and export of JACKS, as an economic activity, contributes to sustainable development, by fostering social, environmental and economic development, particularly in some of the poorest rural areas in the world. The positive externalities generated by the use of JACKS-based products can help offset some of the negative environmental impacts associated with plastic production and disposal. This document begins with a brief description of the conventional plastic and plastic bags markets and the related environmental effects, it then discusses the global trend towards environmentally sustainable alternatives, before examining the opportunities and challenges for JACKS as a substitute to plastic products.

3. The objective of the paper is to initiate a discussion on JACKS-based alternatives to plastics and to seek guidance from the JM on the need for further work, recognizing the knowledge gap that exists and the necessity to engage the Members of the JM. This means providing the Secretariat with the necessary qualitative and quantitative information, particularly on production costs of various fibres, output prices and relevant national policies in place. Should the JM decides to continue with this work, it is recommended that an action plan be drawn, outlining clear follow-up actions.

II. THE BOOMING PLASTIC SECTOR AND ITS CHALLENGES

4. Since the 1950s, growth rate of plastic production has largely outpaced that of any other material, with a marked global shift from the production of durable plastics to single-use plastics. In 2016, the world generated 242 million tonnes of plastic waste equivalent to 12 percent of all municipal solid waste (Kaza, S., et al., 2018). Packaging accounts for about half of the plastic waste in the world (UNEP, 2018). If the growth in plastic production continues at the current pace, by 2050 the plastic industry may account for 20 percent of the world's total oil consumption.

5. Concerns over plastic bags[1] have increased rapidly from being a waste problem at local level to a global health and life-threatening issue. Plastic bags are becoming a real hazard for the environment as they end up as litter in waterways and a direct threat to storm water systems. Livestock as well as marine and wildlife are threatened by ingestion and entanglement of plastic bags. Likewise, humans are affected, as these bags can block drainage and sewer systems, leading to health hazards. Plastic bag litter is threatening agricultural production and food security, leading to hormonal disruption in animals, contaminating water sources, killing fish and creating visual pollution in many countries. In an effort to regulate trade in plastic waste, 187 countries signed, in May 2019, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes. Under the Convention, countries will need to give their consent before a shipment can take place. However, implementing and monitoring the agreement is seen as a major challenge.

6. Single-use plastic bags are typically utilized at the retail point of sale for carrying goods. They are known to be shopping bags "of any thickness, used by consumers to carry goods and not necessarily meant to be re-used multiple times" (Rachel, M., 2012). Disposable shopping bags are the most common thin-filmed plastic bags that are made from crude oil and natural gas, both non-renewable energy sources limited in their supply (Dikgang, J., Leiman, A., Visser, M., June 2012; UNEP, 2018).

7. As an icon of modern convenience, these bags are made of polyethylene – or polythene – a tough, light, flexible, synthetic resin obtained by polymerizing ethylene[2]. They are popular with consumers and retailers as they are a light, cheap, strong, hygienic and easy to make way to transport food and products.

8. Plastic is a resistant material which can be moulded in a variety of ways and utilized in a wide range of applications. Unlike metals, plastics do not rust or corrode. Most plastics are not biodegradable, but instead photodegradable. They slowly break down into small fragments known as microplastics (UNEP, 2018). Plastic bags consume less energy and water in their production cycle and generate less solid waste than paper bags, taking up less space in landfills. However, some of the characteristics that make the convenient plastic bags commercially successful also contribute to making them environmentally unsustainable and difficult to recycle.

9. There are two main types of single-use plastic shopping bags (PSB): high-density polyethylene (HDPE), commonly found in grocery stores, and low-density polyethylene (LDPE), identified as 'boutique' style bags. Foamed plastics, commonly, but often erroneously, referred to by the brand name "Styrofoam", is the material most widely used to produce food containers as it is rigid, lightweight, and has good insulation properties (UNEP, 2018).

III. MAJOR SUSTAINABILITY CONCERNS ASSOCIATED WITH PLASTIC BAGS

10. The use of plastic shopping bags has been increasing throughout the last decades. This trend is expected to continue, as urbanization, population and per capita income rise. For example, the use of HDPE shopping bags in Victoria, Australia, is set to grow by about 1.61 percent per year from 2016-17 to 2026-27, with HDPE bag consumption increasing from approximately 1.6 billion bags to 1.9 billion bags per year. The use of LDPE shopping bags is foreseen to increase by about 0.22 percent

[1] The first plastic bags were introduced in the 1970s as food packaging in the United States of America, later they were used as waste or bin bags. The first plastic bags started to be manufactured on a commercial scale in 1973. In 1977, the plastic grocery bag was introduced to the supermarket industry as an alternative to paper sacks. In the 1980s, markets experienced an explosion in the number of plastic bags available at supermarkets. In the 1990s, consumer's distaste and disapproval of the environmental impact of plastic bags started to grow.

[2] The original meaning of "plastic" is derived from Greek *"plastikos",* meaning easy to process, shape and form.

per year during the same period, from about 130 million bags per year to 133 million bags per year (Marsden Jacob Associates, 2016).

11. Pollution is a major factor throughout the life cycle of plastic bags. The extraction of oil and natural gas used in their production causes greenhouse gas emissions. It is estimated that 12 million barrels of oil are used to produce 100 billion plastic bags, the consumption of the United States of America alone.

12. Plastic bags are very prone to traveling long distances due to their lightweight parachute design. They pick up chemicals and contaminates along the way and poison waterways and wildlife. Their light weight leads to a tendency to "balloon" and be blown by wind at open waste disposal sites, traveling for miles and ending up in trees, bushes and waterways.

13. Disposed plastic bags are blocking waterways in cities. Furthermore, when floating in the water they are being harmful to many kinds of marine life. An estimated 267 different wildlife species have been harmed by plastic debris while, as plastic breaks into smaller pieces, it is more likely to infiltrate the human food chain[3] (Ryan, A., 2017).

14. By clogging sewers and providing breeding grounds for mosquitoes and pests, plastic bags can also increase the risk of transmission of vector-borne diseases like malaria. Furthermore, in poor countries, plastic waste is often burned for heat or cooking, exposing people to toxic emissions. Burning plastic waste in open-air pits releases harmful gases like furan and dioxin bringing an additional threat to public health (UNEP, 2018).

IV. TRENDS IN ANTI-CONVENTIONAL PLASTIC BAG POLICY: DEVELOPING COUNTRIES LEADING A GLOBAL MOVE

15. Countries, cities and municipalities have adopted a variety of regulatory tools to deal with the plastic bag pollution problem, ranging from traditional control regulation, including explicit prohibitions against the use of plastic bags, to regulatory systems that incorporate price-based tools and other incentives (Convery et al., 2007; Nolan, 2002; Rayne, 2008; UNEP, 2005; Dikgang, J., et al., 2012). The various strategies that governments have adopted fit into four broad categories: levies on consumers, voluntary agreements with retailers, total bans, and border levies at regional level.

16. The number of policies regulating plastic bags at national level has increased steeply since 2015 and this trend is likely to continue in the future. To date, more than 60 countries have introduced bans and levies to curb single-use plastic waste (Ryan, A., 2017). Africa stands out as the continent where the largest number of countries have recently introduced diverse measures aimed at limiting the production and use of plastic bags. Of the 25 African countries having introduced national bans on plastic bags, more than half (58 percent) shifted into implementation between 2014 and 2017 (UNEP, 2018).

17. Ireland, Italy and most recently France have enacted bans, while England has a tax that went into effect in 2015. Cities in the United States of America, including San Francisco and California, as well as the District of Columbia, have enacted bans on single-use plastic bags since 2007, amid resistance from major lobbies. There is a globally emerging consensus that future costs of removing all single-use plastics accumulating in the environment will be higher than the costs of preventing littering today.

[3] Plastic waste and microplastics, if ingested by fish or other marine life, can enter the food chain. Microplastics have already been found in common table salt and in both tap and bottled water (UNEP, 2018).

V. ASSESSING THE IMPACTS OF ANTI-SINGLE USED PLASTIC BAGS POLICIES

18. While it is too early to assess the effectiveness of different measures against plastic bags, some lessons can already be drawn. An impact assessment of national bans and levies on plastic bag usage based on more than 60 countries shows a significant drop in the consumption of plastic bags within one year from the entry into force of the national ban or levy (UNEP, 2018).

19. The recycling rate is still very low and burning plastics have brought in more pollution, while alternatives remain costly and have not been sufficiently assessed and advocated. Only 9 percent of the 9 billion tonnes of plastic the world has ever produced has been recycled (UNEP, 2018; Macur, B.M., and Pudlowski, Z.J., 2009).

20. Plastic that does not end up in the environment finds its way to landfills or in incineration plants, causing the release of "priority pollutants" as well as greenhouse gases. Plastics that end up in landfills take even longer to photodegrade due to the lack of sun exposure and oxygen. When in landfills, chemicals from the plastics leak out into the surrounding habitats causing greater pollution.

VI. PROMOTING ALTERNATIVES: JACKS AND COMPOSITE PLASTIC MATERIAL

21. Beyond short-term and hasty alternatives, one of the possible long-term solutions to the plastic bag problem lies in biodegradable plastic films, which decompose when exposed to air, water or sunlight. The world is already producing a certain amount of biodegradable plastic films and the capacity of bio-based plastics is expected to reach 3.45 Mt in 2020, up from 0.36 Mt in 2007, with the United States of America and the European Union leading the way (Li Shen, 2011).

22. In 2019, the total plastic industry was valued at USD 561 billion, while the value of the bio-plastic industry amounted to USD 21 billion, corresponding to a 4 percent market share. The total plastic market value is expected to reach USD 1127 Billion in 2030, with the bio-plastic market valued at USD 324 billion, that is a 40 percent market share. (Pavel, S., Supinit, V., 2017). Europe is the largest consumer of biodegradable plastics holding more than 35 percent of the global market share. The most important sales sector for bioplastics remains the packaging industry - from demand for bottles to the production of bags and sacks. Strict implementation of anti-conventional plastics environmental regulations, and preferences for more environmentally sustainable alternatives, underpins the significant growth in bioplastics consumption, particularly in Europe[4].

23. Hybridization is enabling two or more polymers to be reinforced with one filler, or more fillers, allowing the JACKS to be utilised in the plastic industry (Mochane, and al., 2019). For example, the plastic industry is using natural fibres such as wood, silk, ramie, jute, hemp, kenaf, sisal, coir, flax, bamboo with thermoplastics and thermoset plastics to produce natural fibre-reinforced bio-composites that can substantially replace traditional polymers. Polymer composites reinforced with natural fibres have shown a great potential in food packaging, domestic furniture, agricultural, biomedical building and residential applications. More than 65 percent of natural fibre composites has application in packaging industries. Bioplastics are also efficient in packaging fresh products and perishable foodstuffs, as they improve the shelf life of products. Bangladesh has been pioneering a biodegradable poly bag using plastic that derives from jute-based materials. The bag is biodegradable and compostable within two to three months. Its main chemical ingredients are jute cellulose (72–75 percent) and synthetic polymer as binder and cross-linker.

[4] A bioplastic is a plastic that is made partly or wholly from materials derived from biological sources, such as sugarcane, potato starch or the cellulose from trees and straw. Bioplastics are often designed so that they biodegrade or compost at the end of their useful life, aided by fungi, bacteria and enzymes.

24. While bioplastics are generally considered to be more eco-friendly than traditional plastics, there are few points to consider. Bioplastics and JACKS-based plastics production can result in greater amounts of pollutants, due to the fertilizers and pesticides used in growing the crops and the chemical processing needed to turn organic material into plastic. Bioplastics also require extensive land use, which competes with food production, and the petroleum used to run the farm machinery produces greenhouse gas emissions. Biodegradability of bioplastics also requires high temperature industrial composting facilities, including collection systems and composting facilities, which might be lacking in many cities and countries. Bioplastics are also relatively expensive, and the high costs act as a major constraining factor for market expansion.

25. The growing number of plastics produced from renewable resources, such as JACKS, are often marketed as biodegradable or bio-based. The term "biodegradable" may mislead customers to mean bags that are fit for home composting or bags that break down in the environment naturally and quickly. In practice, the majority of biodegradable plastics only biodegrade under conditions (high temperatures) met in incineration plants but rarely in the natural environment (UNEP, 2018(b)).

26. Another concern is related to linkages between natural fibres based proposed alternatives, public health and food safety issues. The existing few alternatives to plastic bags, including jute, cotton, canvas, non-woven and bamboo bags are safer substitutes, but all are not convenient for bringing liquids and wrapping wet foods. Reusable and especially cloth bags are not hygienic like plastic bags. They can be a microbial habitat and breeding grounds for bacteria, yeast and mould, if proper hygiene is not observed. Managing the transition from plastic bags to environmentally friendly alternatives will imply addressing hygiene and food loss concerns raised by small-scale vendors.

27. Despite all the environmental concerns associated with plastic bags, HDPE bags are, for each use, almost 200 times less damaging to climate than, for example, cotton. They also carry less than one third of the CO2 emissions than paper bags. In order to balance the impact of each plastic bag on the environment, consumers would have to use the same cotton bag every working day for a year or use paper bags at least twice before disposal or recycling (Edwards and Fry, 2011). Similarly, transporting the same number of jute or cotton bags than plastic bags requires more ships and lorries, hence burning more fuel and emitting more CO_2 (Kirsty Bell and Suzie Cave, 2011).

VII. THE ECONOMIC CHALLENGES FACING JACKS PRODUCTS AS ALTERNATIVES TO PLASTIC BAGS AND PLASTIC GOODS

28. From a technical perspective, JACKS-based bags and bioplastics represent established alternatives to conventional plastic bags. However, the main challenge facing these fibres is their relatively elevated cost in comparison to conventional polymers. To increase the competitiveness of JACKS-based bags, such as jute bags, productivity-enhancing investments are required throughout the value chain, from farm to fibre to final items. In particular, investments that target rural areas by expanding capital infrastructure such as roads, warehouses and power units, can help deepen the connectivity of JACKS producing areas, resulting in lower production costs and enhanced competitiveness.

29. In addition to capital investment, technological improvements and product innovations can result in greater output and lower marginal costs. The effect of innovation and technology on JACKS fibres and JACKS-based bioplastics is a dynamic process. At a first stage, the cost per unit is relatively elevated, given available technology, factor input and output prices. As a result, producers are able to access a market segment where consumers are relatively insensitive to prices, but the size of that market is relatively limited.

30. Improvements in productivity that result from the introduction of new technologies or innovations in production processes, lead to declining marginal costs per unit. At that point, producers are able to sell their produce at reduced prices, which enables access to a much bigger and price-sensitive market. In the long run, however, it is unlikely that productivity gains can turn JACKS-based bags into perfect substitutes to plastic bags, but at least, they can enhance their competitiveness by

improving their affordability and accessibility. Gains in productivity can be harnessed at every stage of the JACKS value chain, in particularly at the retting, dying and yarning phases. Also, a more integrated value chain can help spread fixed costs over a wide range of product lines. Currently, among the JACKS, jute is the only material in a position to be price competitive with single use plastics. For the others, the costs still remain relatively high or have better alternative applications.

31. Aside from JACKS-based bags, which tend to be at the higher end of the cost curve, there is considerable scope for developing commercial opportunities for other JACKS-based fibres such as composites, geotextiles, nanocomposites and biomaterials. The financial and economic viability of the production and trade of these products can be enhanced through further research and development so to strengthen their competitiveness against existing products. The benefits of these investments could spill over to other JACKS-based products, including bags and other bioplastic items.

32. Various non-price factors may also influence the extent of JACKS competitiveness with respect to man-made fibres. These include: technical characteristics, quality, reliability of supplies and effective marketing strategies. Jute and hard fibres supplies are unstable due to the dependence on weather conditions and long distance transport and are occasionally subject to problems of quality. Synthetic fibres have regular supplies, they can be produced at short notice and production firms usually adopt aggressive marketing strategies. However, the environmental advantages of JACKS fibres over synthetic fibres, characterized by lower energy demand and waste production, could enhance the competitiveness of JACKS.

33. Production policies, such as those favouring crops, also influence farmer planting decisions. To limit supply variability at the farm level, producers need: access to markets and finance; extension advice to improve productivity, production and quality; access to information (market, technical and research and development); and, generally, strategies to promote fibres' production as a viable business.

34. On the demand side, competitiveness is influenced by prices of JACKS relative to those of competing fibres, particularly synthetics, in various end-use markets where substitution is a technically acceptable option. The structure of the petrochemical industry, which is often vertically integrated, allows for a flexible allocation of cost components between the various outputs at any given stage of the processing chain. In general, the price difference is more important at the first stage of the processing chain, where polypropylene resin is often more expensive than jute or sisal fibre, due to the relatively high and fluctuating price of crude oil. Although the prices of synthetics may be higher at the time of their introduction, subsequent production increases and resulting scale effects on costs can reduce them.

35. The competitiveness of JACKS relative to synthetic materials is also affected by market access conditions at both, regional and international levels. JACKS demand has recovered largely through competitive prices and deliberate policy choices by commodity traders. For example, to promote the jute sector, the Government of India approved in November 2018 a proposal that 100 percent of food grains be packed in jute packaging materials (previously it was 90 percent). Similarly, in Bangladesh, a so-called Mandatory Jute Packaging Act was enacted in 2014, and implemented in 2017, under which all kinds of packaging in the country's business sector have to be made of jute, and currently covers 19 commodities.

36. Tariffs on JACKS have generally been reduced under both, multilateral and bilateral trade liberalization. The main constraints to market access remain the tariff escalation of imports of processed products in several developing countries, which are in direct competition with imported products, and non-tariff measures, which, for JACKS, are mainly requirements related to environmental sustainability. JACKS products need to comply with multiple production standards for dyes, fibres and bleaching chemicals, as well as packaging requirements. These codes mainly correspond to environmental and labour standards, which can significantly raise suppliers' costs, especially where multiple codes with different monitoring and reporting requirements are involved. In

addition, in producing countries, where small and medium enterprises play an important role as exporters, industries may find it relatively more difficult to respond to stringent environmental requirements.

VIII. CONCLUSION

37. The conventional plastic bag industry has registered a high growth over the past decades building on the reputation of a strong, light, flexible, convenient and cheap product. Recently, however, increasing public concerns have emerged on the sustainability of plastic use and particularly its negative effects on the environment. While it is still early to assess the impact of policy shifts towards tighter regulations on plastic products, notably plastic bags, it is clear that the business-as-usual-scenario is no longer an option. The lack of sustainable and affordable alternatives to plastic remains a societal and economic challenge.

38. Bioplastic and JACKS-based products can offer a credible substitute to conventional plastics, including plastic bags, provided that value chain constraints are properly addressed. These include the relatively high per-unit production cost, the lack of supply reliability, and the issues of quality and generic product promotion.

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