ASSESSORS' CONSOLIDATED REPORT ON BASF PHILIPPINES, INC.'S SOYBEAN A5547-127 RENEWAL APPLICATION FOR DIRECT USE AS FOOD AND FEED, OR FOR PROCESSING

EXECUTIVE SUMMARY

On March 1, 2021, BASF Philippines Inc. submitted the renewal application of Soybean A5547-127 for direct use as food and feed, or for processing, under the DOST-DA-DENR-DOH-DILG Joint Department Circular (JDC) No. 1 Series of 2016.

The said transformation event has previously obtained a Biosafety Permit for direct use as food and feed, or for processing on February 1, 2017, under the JDC.

After reviewing the Risk Assessment Report and attachments submitted by the applicant, the Scientific and Technical Review Panel (STRP) concurred that soybean A5547-127 continues to be as safe as its conventional counterpart and is not expected to pose any significant risk to human and animal health, and that any risks posed could be managed by measures stipulated in the notarized DENR PDR form submitted by the applicant.

The Department of Environment and Natural Resources – Biosafety Committee (DENR-BC) evaluated the documents and scientific evidence from literatures submitted by the BASF Philippines Inc., and concluded that the regulated article poses no significant adverse effect to the environment.

The Department of Health – Biosafety Committee (DOH-BC) also concluded that Soybean A5547-127 is as safe as its conventional counterpart and the use of the event in its usual context is not expected to pose any new or additional risk to human health and environment, based on the evaluation of available scientific papers, study reports, and dossier documents presented for its permit renewal.

Furthermore, the Socio-economic, Ethical and Cultural (SEC) Considerations expert also recommended for the approval and issuance of biosafety permit for this regulated article after assessing the socio-economic, social, and ethical indicators for the adoption of Genetically Modified Organisms.

Background

In accordance with Article VII. Section 20 of the JDC No.1, S2016, no regulated article, whether imported or developed domestically, shall be permitted for direct use as food and feed, or for processing, unless: (1) the Biosafety Permit for Direct Use has been issued by the BPI; (2) in the case of imported regulated article, the regulated article has been authorized for commercial distribution as food and feed in the country of origin; and (3) regardless of the intended use, the regulated article does not pose greater risks to biodiversity, human and animal health than its conventional counterpart.

The BPI Biotech Office provided the assessors, except for the SEC expert, the complete dossier submitted by BASF Philippines, Inc. The SEC expert, on the other hand, was provided with the questionnaire on socio-economic, ethical, and cultural considerations that have been addressed by BASF Philippines, Inc. in relation to their application.

INFORMATION ON THE APPLIED EVENT

Soybean event A5547-127 contains a modified form of the *pat* gene under the control of promoter and termination sequences derived from cauliflower mosaic virus. The *pat* gene in A5547-127 soybean expresses the phosphinothricin-acetyltransferase (PAT) protein, which acetylates L-phosphinothricin into a non-phytotoxic metabolite (N-acetyl-L-glufosinate) and confers tolerance to the herbicide glufosinate ammonium.

Summary of Regulatory Approvals: Country, Year and Type of Approval

Country	Food direct use or processing	Feed direct use or processing	Cultivation domestic or non-domestic use
Argentina	2011	2011	2011
Australia	2004		
Brazil	2010	2010	2010
Canada	2000	2000	1999
China	2014 *	2014 *	
Colombia		2012	
European Union	2012 *	2012 *	
India	2014 *	2014 *	
Iran	2016		
Japan	2002	2003	2006
Malaysia	2014	2014	
Mexico	2003		
New Zealand	2004		
Nigeria		2018	
Philippines	2011 *	2011 *	
Russia	2008	2007	
Singapore	2015	2015	
South Korea	2011	2011	
Taiwan	2010		
Turkey		2015	

United States	1998	1998	1998
Uruguay			2012
Vietnam	2015	2015	

Source: https://www.isaaa.org/gmapprovaldatabase/event/default.asp?EventID=166

STRP's Assessment

1. Permit Conditions

a. The applicant published the approval of the Biosafety Permit on March 24, 2017 on Manila Bulletin, a newspaper of general and national circulation in the Philippines. Permits are also available to access through the BPI Biotech website (www.biotech.da.gov.ph).

b. There is no spillage recorded in relation to the event since its previous approval on February 1, 2017. In case of accidental spillage resulting in germination and persistence in the environment, the importer shall inform Bayer CropScience Inc. and the Department of Agriculture - Bureau of Plant Industry (DA-BPI) for the identification of appropriate remedial measures to protect human and animal health or the environment.

c. BASF complied with the conditions for Direct Use and must continue to do so as set by the Bureau of Plant Industry in the Biosafety Permit (Number 17-002 FFP). Even if BASF does not import, handle or transport material, it is necessary that the importer still inform them and DA-BPI in case of accidental release to the environment for identification of remedial measures and extension of assistance as may be needed [1].

d. Risks are not expected *ab initio,* as necessary preparations have been done to inform the public and DA-BPI of remedial measures and assistance if needed.

2. Other Scientific Papers

a. There are no toxicological or allergenic concerns raised over a two-event (FG 72 x A5547-127) and a three-event stack (Soybean MON 87708 × MON 89788 × A5547-127) soybean through evaluation including molecular, agronomic, phenotypic, and compositional data. The applicant and updated bioinformatic analyses also reported no new safety issue concerning the events thereby concluding that the safety of the events remains valid [2][4].

b. The phosphinothricin-N-acetyltransferase (PAT) protein produced in the genetically modified soybean event A5547-127 does not pose any safety concerns relevant to the food and feed safety assessment of the protein by genes isolated from *Streptomyces viridochromogenes (pat* gene*).* The protein is expressed in highest amounts in the leaves of soybeans [3].

c. Genetic and compositional analyses show that PAT protein's introduction to crops do not affect the recipient crops' genetic stability and has no unintended effects with biological significance. *In vitro* and bioinformatic analyses did not also show any protein toxin or allergen properties [3].

d. Bioinformatic analysis was conducted using BLAST and identified that the insertion locus of the *pat* originates from soybean chromosome 18. It further indicates that the insertion of T-DNA sequences will unlikely interrupt any endogenous soybean genes [5].

e. The PAT protein and its potential N-glycosylation sites were tested through several *in silico* approaches and found that there are no potential N-glycosylation sites and that there are no allergenic or toxicological findings [6].

STRP's Conclusion

The STRPs found sufficient and scientific evidence that the regulated article petitioned for renewal continues to be as safe as its conventional counterpart and is not expected to pose any significant risk to human and animal health. Any risks posed could be managed by measures stipulated in the notarized DENR PDR form submitted by the applicant.

BAI's Assessment

1. Permit Conditions

The applicant has complied the conditions set in the biosafety permit in publishing the Biosafety Permit approval as well as reporting to BPI in case of accidental spillage, hence the event was approved for direct use as food and feed but not for propagation.

2. Scientific Studies

The results of the *in silico* analyses, comparative field trials, allergenicity and toxicity of the transgene, and nutritional composition were conducted and showed that the GM crop and its transgene are safe for use for food and feed.

3. Other Scientific Papers

The two or three-event stacking of the transgenic Soybean A5547-127 with another genetically modified plants of the same kind shows no interaction of genes that will be of adverse health effects. Furthermore, toxicological and feeding analyses are consistent in most transgenic events, which shows that the transgenic plant is safe for food and feed use [2][3][4].

4. Prior Review of the Department, if any

The results of evaluating Soybean A5547-127 by BAI, BPI-PPSSD, STRP, DOH, DENR and SEC provided that the GM crop is safe for direct use for food and feed or for processing.

BAI's Conclusion

The BAI found a scientific evidence that the regulated article petitioned for renewal continues to be as safe as its conventional counterpart and is not expected to pose any significant risk to animal health.

BPI-PPSSD's Assessment

1. Permit Conditions

The applicant has complied with the biosafety permit for direct use as food and feed, or for processing of Soybean A5547-127 (Number 17-002 FFP) through the information dissemination pertaining to the FFP approval, and the identification of appropriate measures in case of accidental release in the environment.

2. Other Scientific Papers

a. The genetic stability of the insert, protein expression analysis, comparative analyses of compositional, agronomic and phenotypic characteristics, and toxicity and allergenicity analyses of the novel proteins indicate that a two stack (FG72 and A5547-127) and a three-stack event (MON 87708, MON 89788 and A5547-127) shows no new data that could pose food safety risk to humans [3][4].

b. Toxicological and allergenicity studies indicate that the novel protein does not share similarities to known toxins and allergens [3][4].

c. The crops' genetic stability was not affected by the PAT protein and did not display any signs similar to a toxin or allergen protein when exposed to heat and gastrointestinal fluid [3].

d. There are no proven potential allergenicity of the PAT protein produced by Soybean A5547-127 according to the results based on the submitted final report of PAT protein Bioinformatics assessment of amino acid sequence identity [6].

e. Through the FASTA algorithm, COMPARE allergen database, and complete query sequence search, it is shown that the PAT protein is not significantly similar to any known allergenic protein and has no potential N-glycosylation sites [6].

BPI- PPSSD's Conclusion

BPI-PPSSD found scientific evidence that the regulated article petitioned for renewal continues to be as safe as its conventional counterpart and is not expected to pose any significant risk to human and animal health.

Additionally, after a thorough review of the new studies submitted by BASF Philippines, Inc., PPSSD found that the new studies submitted by the applicant will not affect the previous food safety risk assessment conducted for Soybean A5547-127 (AIS-FRA-16-01).

DENR- BC's Assessment

After a comprehensive review and evaluation of the documents and scientific evidence from literature submitted by the BASF Philippines Inc. concerning its application for direct use for food, feed, or for processing of Soybean A5547- 127, the DENR-BC considered that the regulated article poses no significant adverse effect to the environment on the following bases:

a. Soybean has a history of safe use and the regulated article has previously been approved in nineteen (19) countries for food, in seventeen (17) countries for feed, and in six (6) countries for cultivation [7][8].

b. The introduced gene product is not harmful when ingested by wildlife since the protein is not similar to any known toxin or allergen and has been previously assessed for its food and feed safety [3][9].

c. It is less likely that the regulated article would persist in the environment in case of unintended release. Soybean does not grow in unmanaged habitats [10].

d. The project description report (PDR) indicates the environmental management plan indicating the possible risk and harm to the environment particularly on biodiversity, as well as the mitigating measures and contingency plan [3][7][8][9][10].

DENR-BC's Conclusion

Based on the review and evaluation, the DENR-BC considered that the regulated article poses no significant adverse effect to the environment.

DOH-BC's Assessment

a. Soybean has a history of safe use as it is cultivated since 1800 in America for soybean sauce, forage, protein, and oil. Its protein has a wide range of technical, food, and feed uses [11][12].

b. PAT protein does not possess characteristics associated with food toxins and allergens [6][13].

c. The GMO Panel considers that the safety of two single events (FG72 and A5547-127) and three single events (MON 87708, 89788, and A5547-127) remain valid because of the lack of safety concerns as assessed by the European Food

Safety Authority (EFSA) and new safety issues as per bioinformatics analyses and applicant's report. Furthermore, they are expected to be as safe and nutritionally equivalent to its conventional counterpart [2][4].

d. The presence of PAT protein in crops does not pose any significant risk in addition to its conventional counterpart as per genetic, compositional, bioinformatic, *in vitro*, acute oral toxicological and feeding studies/analyses [3].

e. The insertion of T-DNA sequences in the Soybean A5547-127 locus is unlikely to interrupt any endogenous soybean genes as assessed through bioinformatic analysis, similarity searches using BLASTn and BLASTx [5].

f. The summary of Soybean A5547-127 regulatory approvals in countries as well as the year and type of approval is shown in annex Table 1.

DOH-BC's Conclusion

Based on the evaluation of available scientific papers, study reports and dossier documents presented for its permit renewal, Soybean A5547-127 is as safe as its conventional counterpart for Direct Use as Food, Feed or for Processing (FFP). Use of this event in its usual context is not expected to pose any new or additional risk to human health and environment.

SEC Expert's Assessment

a. The granting of Soybean A5547-127 permit for direct use as food, feed, or for processing will have no significant effect to production and consumption of soybeans in the Philippines since the Philippines is not a major soybean producing country and the event will not be produced locally.

b. Granting a permit to the event would improve the global trade and help increase the consumption pattern of the food processing industry and the poultry and livestock sub-sector, resulting to the stabilization of its supply and price.

SEC Expert's Recommendation

After a thorough and scientific review and evaluation of the documents provided by BASF Philippines, Inc., relevant to BASF Soybean A5547-127, the SEC expert recommends for the approval and issuance of biosafety permit of the said GM product.

REFERENCES

[1] DOST-DA-DENR-DOH-DILG. 2016. Rules and Regulations for the Research and Development, Handling and Use, Transboundary Movement, Release into the Environment, and Management of Genetically-Modified Plant and Plant Products Derived from the Use of Modern Biotechnology. Joint Department Circular No. 1, series of 2016.

[2] Naegeli, H., Birch, A. N., Casacuberta, J., De Schrijver, A., Gralak, M. ł. A., Guerche, P., Jones, H., Manachini, B., Messéan, A., Nielsen, E. E., Nogué, F., Robaglia, C., Rostoks, N., Sweet, J., Tebbe, C., Visioli, F., Wal, J. -. M., Gennaro, A., Neri, F. M., & Olaru, I. 2017. Scientific opinion on application EFSA-GMO -NL-2013-120 for authorization of genetically modified soybean FG72 ×A5547-127 for food and feed uses, import and processing submitted in accordance with Regulation (EC) No 1829/2003 by Bayer CropScience LP and M.S. Technologies LLC. EFSA Journal, 15(4), 1–23. https://doi.org/10.2903/j.efsa.2017.4744

[3] Han, Xianglu & Foundation, ILSI. 2016. A Review of the Food and Feed Safety of the PAT Protein. 10.13140/RG.2.2.21783.98729.

[4] Naegeli, H., Bresson, J. - . L., Dalmay, T., Dewhurst, I. C., Epstein, M., Firbank, L. G., Guerche, P., Hejatko, J., Moreno, F. J., Mullins, E., Nogué, F., Rostoks, N., Sánchez Serrano, J. J., Savoini, G., Veromann, E., Veronesi, F., Álvarez, F., Fernandez Dumont, A., Papadopoulou, N., … De Sanctis, G. 2019. Assessment of genetically modified soybean MON 87708 ×MON 89788 × A5547-127, for food and feed uses, under Regulation (EC) No 1829/2003 (application EFSA-GMO-NL- 2016 - 135). EFSA Journal, 17(7), 1 – 32. https://doi.org/10.2903/j.efsa.2019.5733

[5] Peeters K., 2020. Bioinformatics analysis of the A5547-127 soybean insertion locus. 2020/2087987

[6] Islamovic E., 2020. PAT/pat protein. Bioinformatics assessment of amino acid sequence identity to known allergens and toxins. 20-TXSB0140-ROW

[7] Organisation for Economic Co-operation and Development (OECD). 2000. Consensus document on the biology of *Glycine max* (L.) Merr. (soybean). Retrieved March 15,2021 from http://www.oecd.org/science/biotrack/46815668.pdf

[8] International Service for the Acquisition of Agri-biotech Applications (ISAAA). 2019. GM Approval Database. Retrieved March 15, 2021 from https://www.isaaa.org/gmapprovaldatabase/event/default.asp?EventID=166

[9] Herouet C, Esdaile DJ, Mallyon BA, Debruyne E, Schulz A, Currier T, Hendrickx K, van der Klis RJ, Rouan D. 2005. Safety evaluation of the phosphinothricin acetyltransferase proteins encoded by the pat and bar sequences that confer

tolerance to glufosinate-ammonium herbicide in transgenic plants. RegulToxicolPharmacol, 41(2):134-49.

[10] Canadian Food Inspection Agency (CFIA). 2012. The Biology of *Glycine max* (L.) Merr. (Soybean). Retrieved March 15, 2021 from https://inspection.canada.ca/plant-varieties/plants-with-novel-traits/applicants/directive-94-08/biology-documents/glycine-max-1-merr-/eng/1330975306785/1330975382668

[11] American Soybean Association. 1994. History highlights from 1920 to 2000: 1940s. Retrieved: https://soygrowers.com/about/timeline/

[12] Buenos Aires. 2012. Evaluation of event A5547-123 (soybean tolerant to Glufosinate Ammonium ACS-GMØØ6-4) for human and animal consumption. Retrieved: http://www.fao.org/fileadmin/user_upload/gmfp/docs/A5547-127_english.pdf

[13] Environmental Health Risk Assessment Report for Modern Biotechnology and its Applications (For Direct Use as Food, Feed or Processing (FFP) Soybean A5547-127)

[14] USDA. 2020. Philippines: Oilseeds and Products Annual Attaché Report (GAIN). Retrieved: https://www.fas.usda.gov/data/philippines-oilseeds-and-products-annual-4