



## **BIO-INPUTS FRAMEWORK**



**National Centre for Organic Agriculture**  
**DEPARTMENT OF AGRICULTURE**  
**Ministry of Agriculture and Forests**  
**Royal Government of Bhutan**

**2021**

NCOA/TECHNICAL/21-22/5

## Table of contents

Acronyms.....	i
Introduction.....	ii
Background.....	iii
Definitions .....	iv
Section I: Terms of Reference for the Focal Agencies .....	1
1.1 National Center for Organic Agriculture.....	1
1.2 National Plant Protection Center .....	1
1.3 National Soil Services Center.....	1
1.4 Bhutan Agriculture and Food Regulatory Authority .....	1
Section II: Framework on Bio-pesticides.....	2
2.1 Procurement and Supply of Bio-pesticides.....	2
2.2 Manufacture of Bio-pesticides.....	3
2.3 Management and Storage of Bio-pesticides .....	3
2.4 Use of Bio-pesticides.....	3
2.5 Updated Bio-pesticides Enlisted by NPPC, April 2021 .....	3
Section III: Framework on Bio-fertilizers .....	6
3.1 Procurement and Supply of Bio-fertilizers .....	6
3.2 Management and Storage of Bio-fertilizers.....	7
3.3 Use of Bio-fertilizers .....	7
3.4 Updated List of Bio-fertilizers Permitted for Import and Companies Recognized .....	8

## List of Tables

Table 1: Para-pheromones.....	3
Table 2: Food based lures.....	4
Table 3: Bio-pesticides.....	4
Table 4: List of approved bio-fertilizer.....	8
Table 5: NSSC enlisted companies for import of bio-fertilizers.....	9

## Acronyms

BAFRA	Bhutan Agriculture and Food Regulatory Authority
DoA	Department of Agriculture
GNH	Gross National Happiness
ISO	International Organization for Standardization
MoAF	Ministry of Agriculture and Forests
NCOA	National Center for Organic Agriculture
NOP	National Organic Program
NPPC	National Plant Protection Center
NSSC	National Soil Service Center
OMRI	Organic Materials Review Institute
RNR	Renewable Natural Resources

## **Introduction**

The underlying constraints for promotion or transition to Organic Agriculture (OA) have been the lack of alternative farm inputs to replace the synthetic agro-chemicals. Currently, there are very limited options and alternative bio-inputs to manage crop pests, diseases, weeds, soil fertility and animal feed. Similarly, there is an inadequate supply of organic feed, fodder and availability and access to ethno-veterinary substances to support organic farming.

As the national initiatives on Organic Agriculture gained momentum in the country with the government's vision of achieving 100% organic production system, the need to initiate and establish the procurement and distribution system for bio-inputs was urgently required to facilitate and support the procurement, production and easy accessibility & availability of bio-inputs which are fundamental for organic production system.

The framework shall further decipher the provisions of the Pesticide's Rules and Regulations of Bhutan, 2019 on all aspects of bio pesticides. Similarly, it shall also serve as the guideline for procurement, production and supply of bio- fertilizer and organic fertilizers as there are no existing frameworks.

This framework shall regulate the standards and quality of inputs imported and locally produced. It shall also facilitate the supply and availability of bio-inputs and the engagement of any private sector in the future. Regulating and promoting the use of bio-inputs shall make our agriculture production system sustainable besides maintaining clean and healthy ecosystem; and reduce chronic health issues related to pesticides inputs in long term.

## **Background**

With the growth of organic farming in the country, the demand for organic production inputs (Bio-inputs), which is the fundamental for organic production system is increasing rapidly. To support the growth and development of organic farming sector, it is necessary to ensure a reliable supply system of good quality bio-inputs which is affordable and easily accessible to all organic growers.

Accordingly, recognizing the importance of the bio-inputs for the organic farming, the 70<sup>th</sup> RNR-GNH Committee meeting of Ministry decided to assign the responsibility to facilitate the procurement and distribution of bio-inputs through its agencies to the Department of Agriculture. Thus, in line with the directives of the RNR-GNH committee to expedite the procurement and supply of bio-inputs, the first Implementation Framework and Guidelines for Supply of Bio-Pesticides and Bio-fertilizers in the Country, 2015 was jointly prepared by the Department of Agriculture and Bhutan Agriculture and Food Regulatory Authority (BAFRA) with support from technical agencies such as the National Plant Protection Centre (NPPC), the National Soil Services Centre (NSSC) and the National Organic Program (NOP). The framework was approved by the Ministry of Agriculture and Forests vide Note sheet No DoA/OD/19/9127 on 6<sup>th</sup> November 2015 for implementation.

In view of the increasing demand for bio-inputs and the need to ensure reliable and quality supply availability & affordability and safe use, the Third National Working Group (NWG) on Organic Agriculture directed the NPPC, NSSC, and National Center for Organic Agriculture (NCOA) and BAFRA to review and update the first Framework and Guidelines for Supply of Bio-pesticides and Bio-fertilizers in the Country, 2015. Based on the directives, NCOA facilitated the review process with the technical inputs from NPPC, NSSC and BAFRA.

The first Implementation Framework and Guidelines for Supply of Bio- Pesticides and Bio-fertilizers in the Country, 2015 has been reviewed, reformulated and named as the Framework on Bio-inputs, 2021. The revised framework provides guidance for the in-country production of bio-pesticides, bio- fertilizer and organic fertilizer to meet the increasing demand and to reduce the dependency on import of different synthetic agro-chemical mainly pesticides and fertilizers. It is a step towards achieving the country's vision of sustainable production system by adopting 100% organic farming. This framework contain three sections as follows:

Section I: Terms of Reference for the Focal Agencies directly involved with Bio-inputs procurement, supply, regulation and monitoring.

Section II: Framework and Guidelines on Bio-pesticides.

Section III: Framework and Guidelines on Bio- fertilizers.

## Definitions

In this framework, the following term shall be interpreted to mean as:

1. **Bio-inputs** also known as biological inputs are living organisms or element of biological origin used to enhance agricultural production.
2. **Bio-control** is a method of controlling pests such as insects, mites, weeds and plant diseases using other organisms.
3. **Bio-control** or biological Agents protect plants from their natural enemies like pests and diseases. The bio- control agents are specific to harmful organisms and do not kill useful organisms present in the soil.
4. **Bio-fertilizer** is a substance which contains living microorganisms which, when applied to seeds, plant surfaces, or soil, colonize the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant.
5. **Bio-pesticides** means pesticides derived from natural products including plant parts or extract of plants and microorganisms, use of microorganisms to control other harmful organisms, rearing of predators, parasites or parasitoids.
6. **Pesticides** means synthetic or bio-pesticides including household pesticides unless otherwise specified.
7. **Synthetic Pesticides** means any substance or mixture of substances intended for preventing, destroying or controlling any pest, including, vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feeds, or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.
8. **Organic manures** are natural products used to supply plant nutrients for the crop plants.
9. **Organic fertilizers** are substances made up of one or more unprocessed material(s) of a biological nature (plant/animal) and may include unprocessed mineral materials that have been altered through microbiological decomposition process.
10. **Processor** are individual or group who adds value to the primary produce.
11. **Producer** are individual or group engaged in primary production and harvest of crops, eggs, dairy products, honey and Non-Wood Forest Products (NWFP).

## **Section I: Terms of Reference for the Focal Agencies**

This section provides Terms of Reference (TOR) for four focal agencies directly involved with Bio-inputs.

### **1.1 National Center for Organic Agriculture**

The National Center for Organic Agriculture as an apex body of Organic Agriculture, will facilitate the implementation of this framework, organize review based on needs, and facilitate any coordination required on bio-inputs in close collaboration with NPPC, NSSC and BAFRA. It will also maintain the information on all categories of bio-inputs, list of suppliers, producers and dealers shared by NPPC and NSSC.

### **1.2 National Plant Protection Center**

The National Plant Protection Center shall be the technical authority for the overall coordination, advice and guidance for the procurement, sales, supply, disposal, evaluation, quality control and recommendations on bio pesticides. Any proposals on in-country production of bio-pesticide should be assessed and evaluated by the NPPC. It will develop and review the standards on bio-pesticides. It will maintain and regularly update the data base on bio-pesticide and share the list with NCOA and BAFRA. All producers and suppliers of bio-inputs should register with the relevant technical agencies and comply with the established standards and requirements.

### **1.3 National Soil Services Center**

The National Soil Services Center will function as the technical authority for the overall coordination, advice and guidance for the procurement, supply, disposal, evaluation and recommendations on organic manures and bio-fertilizers. Any proposals on in-country production of bio-fertilizers should be assessed and evaluated by NSSC. It will develop and review the standards on organic manures and bio-fertilizers. It will maintain and regularly update the data base on organic manures and bio-fertilizers and share the list with NCOA and BAFRA.

### **1.4 Bhutan Agriculture and Food Regulatory Authority**

The Bhutan Agriculture and Food Regulatory Authority as the enforcement authority for the Pesticide Rules and Regulation of Bhutan, 2019 and the Plant Quarantine Rules and Regulations of Bhutan, 2018 will oversee the implementation of this framework. Additionally, it will maintain and regularly update the data on all types of bio-inputs shared by NPPC and NSSC.

The roles of other stakeholders on bio-inputs could be expanded through the executive orders from the Ministry of Agriculture and Forests as and when required.

## **Section II: Framework on Bio-pesticides**

This section outlines the framework on bio-pesticides.

### **2.1 Procurement and Supply of Bio-pesticides**

1. The NPPC will be the technical authority for all matters related to bio-pesticides.
2. All bio-pesticide products will have to be first enlisted with the NPPC for approval by the Pesticide Board.
3. The approved bio-pesticides list will be maintained by the NPPC which will also be shared with the BAFRA for regulation and the NCOA for information, promotion and use.
4. Enlistment and endorsement of bio-pesticides will be done in accordance with the existing Pesticides Rules and Regulation of Bhutan, 2019.
5. The NPPC will screen the enlisted products based on relevant certifications standards such as International Organization for Standardization (ISO), Organic Materials Review Institute (OMRI), National Accreditation Board for Testing and Calibration Laboratories, (NABL), India or any other internationally recognized bodies.
6. The NPPC will be the authorized agency for procurement and supply of bio-pesticides in the country. No private companies, individuals or organizations will be allowed to procure and distribute bio-pesticides in the country. Permits for the import of bio-pesticides will be issued by the BAFRA.
7. Any import of bio-pesticides should comply with the procedures laid down in the Pesticide Rules and Regulation of Bhutan, 2019 and Plant Quarantine Rules and Regulations of Bhutan, 2018 and prescribed standard for bio pesticides.
8. Use of bio-pesticides for commercial purpose should be evaluated by the NPPC and endorsed by the Pesticides Board.
9. The supply of bio-pesticides either imported or sourced within the country needs to be approved by the Pesticides Board.
10. Procurement and distribution of bio-pesticides shall follow the existing mechanisms for other agricultural inputs including the cost sharing mechanism or other measures implemented by the Ministry of Agriculture and forests.
11. Dzongkhags, individuals or any other agencies requiring bio-pesticides should indent their bio-pesticide requirements with the NPPC as per the existing system.
12. The NPPC will coordinate awareness on the usage of bio-pesticides.
13. Any bio-pesticides offered by interested private companies for promotional purposes must fulfill the following criteria.
  - i. The company and the products must fulfill the certification and accreditation requirements as specified under clause 5 of this framework.
  - ii. Such products will be subjected to efficacy trials by the NPPC before recommendation to Pesticides Board for endorsement.
  - iii. Cost of the products and transportation charges of the product till NPPC for efficacy trials and its disposal if any during the evaluation process must be borne by the company.

## 2.2 Manufacture of Bio-pesticides

1. In-country production of bio-pesticides both at national and household level and formulation of botanical extract or bio control agent from local plant and resources shall be supported to reduce import through public funding for research and development.
2. Investment by private sector in the PPP mode for the bio-pesticides production shall be encouraged.
3. Domestic production of bio-pesticides shall be governed by Chapter 3 of the Pesticide Rules and Regulations of Bhutan, 2019.

## 2.3 Management and Storage of Bio-pesticides

1. It is mandatory to have a separate store for bio-pesticides.
2. Product should be stored in dry place at room temperature, exposure to extreme temperature and direct sunlight should be avoided.

## 2.4 Use of Bio-pesticides

1. The bio-pesticides users should strictly follow the instructions prescribed in the packages for handling and storage of bio-pesticides.
2. Bio-pesticide should not be mixed with synthetic pesticides such as fungicides, insecticides or weedicides during application.
3. Recommendations on dosage and applications made by NPPC should be strictly followed. The recommended dosage of available products can be referred from NPPC *website: [www.nppc.gov.bt](http://www.nppc.gov.bt)*

## 2.5 Updated Bio-pesticides Enlisted by NPPC, April 2021

The different types of bio-pesticides enlisted with NPPC as of April 2021 are presented in Table 1, 2 and 3.

**Table 1: Para-pheromones**

No	Common Name	Acronym	Chemical Composition	Field Longevity(weeks)
1	Trimedlure	TML	tert-butyl 4 (and 5)- chloro-2methylcyclohexane1 – carboxylate	Polymeric plug — 6 Liquid-2 to 4
2	Methyl Eugenol	ME	Benzene, 1 ,2-dimethoxy-4-	Polymeric plug — 6 Liquid-

			(2propenyl)	2 to 4
3	Cuelure	CUE	4-(p-hydroxyphenyl)- 2-butanone acetate	Polymeric plug- 6 Liquid 2-4

**Table 2: Food based lures**

No	Common name	Chemical Composition	Field Longevity (weeks)
1	Protein baits: Torula yeast-borax; Protein derivatives	Torula yeast-borax; Hydrolized protein	Pellet (1-2) Liquid (1-2)
2	Synthetic food lures: Ammonium acetate	Ammonia + acetic acid	Membrane-based (4-6) Liquid (1) Polymer (4)
3	Ammonium (bi)carbonate	Ammonia	Membrane-based (6) Liquid (1) Polymer (4)
4	Ammonium salts	Ammonia Salt	
5	Putrescine	1,4 diaminobutane	Membrane-based (4-6)
6	Trimethylamine		Membrane-based (4- 6)

**Table 3: Bio-pesticides**

No	Bio-agents	Utilization
1.	<i>Trichoderma asperellum</i> and <i>Trichoderma gamsii</i>	These beneficial fungi have different modes of action and are active over different temperature and environmental conditions. They are effective for diseases caused by <i>Phytophthora capsici</i> , <i>Rhizoctonia</i> , <i>Pythium</i> and <i>Verticillium</i> . General label.
2.	70% or more clarified hydrophobic extract of neem oil.	Labeled generally for several insects and diseases, including <i>Alternaria</i> , anthracnose, downy mildew, leaf spot, and powdery mildew in cucurbits.
3.	<i>Bacillus subtilis</i> strain QST 713.	This bacterium colonizes roots and produces compounds that affect pathogens directly and trigger metabolic pathways to activate the plant's natural defenses and modulate growth.  Labeled for diseases caused by <i>Rhizoctonia</i> , <i>Pythium</i> , <i>Fusarium</i> , <i>Verticillium</i> and <i>Phytophthora</i> .
4.	<i>Bacillus subtilis</i> strain QST 713.	Broadly labeled for use on greenhouse vegetables. Labeled for angular leaf spot, anthracnose, bacterial fruit blotch, downy mildew, gummy stem blight, and powdery

		mildew in cucurbits.
5.	<i>Trichogramma spp.</i> (egg parasitoids)	Used for control of shoot borer, bollworms, stem borer
6.	NP Virus of <i>Helicoverpa armigera</i> & <i>Spodoptera litura</i>	Used against bollworms and pod borers
7.	Neem Oil and Cake Neem ban 50000 PPM	Wide range of insect pests
8.	Bt ( <i>Bacillus thuringiensis</i> preparation)	DBM and other Lepidopteron pests including army worm
9.	Entomopathogenic Fungi (EPF) preparations	To control some insect pests by using some fungal strains
10.	Entomopathogenic Nematodes (EPN)	To control some insect pests using some Nematodes

### **Section III: Framework on Bio-fertilizers**

This section outlines the framework on Bio-fertilizers and Organic manures.

#### **3.1 Procurement and Supply of Bio-fertilizers**

1. NSSC will be the technical authority for all matters related to bio-fertilizers.
2. All bio-fertilizers will have to be first enlisted with the NSSC for endorsement.
3. The enlisting and endorsement of bio-fertilizers will be done in accordance with the Executive order on bio-fertilizers issued by the Ministry of Agriculture and Forests which shall be updated from time to time.
4. The endorsed list of bio-fertilizers will be maintained by NSSC which will be shared with BAFRA for regulation and NCOA for information.
5. The NSSC will screen the enlisted products and recommend them.
6. To ensure the quality, NSSC will only import if they are ISO certified, listed as organic certified products by OMRI; and from other regional and international companies which are certified by internationally recognized bodies.
7. NSSC will be the sole technical authority for procurement and supply of bio-fertilizers. The procurement will be done directly by NSSC from the manufacturer or authorized dealers with import permit issued by BAFRA.
8. The private companies, individuals and other agencies will not be allowed to procure and distribute any biofertilizers in the country for the lack of facilities to assess and monitor the high risk associated with the introduction of invasive microbes through the import of bio-fertilizers.
9. The bio-fertilizers recommended for import will have to meet the quality control criteria prescribed in the Technical Regulations for Organic and Bio-fertilizers 2020 and its subsequent revisions.
10. Procurement and distribution of bio-fertilizer and organic fertilizer shall follow the existing mechanisms for other agricultural inputs including the cost sharing mechanism or any other measures implemented by the Ministry of Agriculture and Forests.
11. The Dzongkhags, individuals or any other agencies requiring bio-fertilizers should indent their requirements with the NSSC as per the indenting system.
12. Prior to recommending any new bio-fertilizers it should be evaluated under the technical supervision of NSSC and endorsed by Technology Release Committee (TRC) of the Department of Agriculture.
13. NSSC will coordinate the awareness and promotion of bio-fertilizers.

14. Any bio-fertilizers offered by interested companies for promotional purposes must fulfill the following criteria.
- i. The company and the products must fulfill the certification and accreditation as specified in clause 6 of this framework.
  - ii. Such products will be subjected to efficacy trials by NSSC before recommending for promotion.
  - iii. Cost of the products and transportation charges of the product till NSSC for efficacy trials and its disposal if any during the evaluation process must be borne by the company.

### **3.2 Management and Storage of Bio-fertilizers**

1. The management and quality control of the bio-fertilizers shall be as per the Technical Regulations for Organic and Bio-fertilizers, 2020.
2. A separate store with well-regulated temperature, humidity, and other required conditions is necessary to store bio-fertilizer because of the nature of the product.

### **3.3 Use of Bio-fertilizers**

Bio-fertilizers are generally applied before planting or transplanting of seedlings; and before sowing of seeds through the different application methods. Third application of bio-fertilizer is done by broadcasting during the flowering stage. The different application methods are listed below:

#### **i. Seedling Root Dip**

This method is usually applicable for transplanted crops such as rice. The seedlings are soaked in the bed of water and kept for 8-10 hours before transplanting.

#### **ii. Seed Treatment**

The seeds are soaked in the mixture of bio-fertilizers. The soaked seeds are then left to dry and are sown as soon as possible.

#### **iii. Soil Treatment**

The bio-fertilizers along with the compost or organic manures are blended and kept for one night. This mixture is then scattered on the soil.

### 3.4 Updated List of Bio-fertilizers Permitted for Import and Companies Recognized

The different types of bio-fertilizers and recognized companies enlisted with NSSC as of April 2021 are presented in table 4 and 5 respectively.

**Table 4: List of approved bio-fertilizer**

No.	Bio-fertilizer	Utilization
1	Symbion-N (selective strains of nitrogen fixing bacteria such as Rhizobium, Azospirillum, Acetobacter and Azotobacter). Available in liquid form.	Harnesses atmospheric nitrogen (20-40 kgs per hectare) and makes it available directly to the plant. Enhances root proliferation through release of growth promoting hormones.
2	Symbion-P (Biofertilizer based on selective strains of Phosphate solubilizing bacteria, <i>Bacillus megaterium</i> var. <i>phosphaticum</i> ). Available in liquid formulation.	Solubilizes fixed phosphorous in the soil into a simpler form and makes it available directly to the plants.
3	Symbion-K (Biofertilizer based on selective strains of Potash solubilizing bacteria, <i>frateuria aurantia</i> ). Available in liquid formulation.	Solubilizes potash locked up in the soil into a simpler form and makes it available directly to the plants.
4	Symbion-S (Biofertilizer based on selective strains of sulphur solubilizing bacteria, <i>Thiobacillus thiooxidans</i> ). Available in liquid formulation.	Oxidizes elemental (non-available sulphur and sulphur related compounds into easily available form to the plants.
5	Symbion-Vam (Vesicular Arbuscular Mycorrhizal preparation containing spores (asexual resting Clamydospores) fragments of mycorrhizal fungal filaments and infected root bits.	Helps to absorb and mobilize primarily phosphorus along with other important macro and micro elements and water. Gives protection to the plants from pathogenic fungi and nematodes causing damage to the roots.
6	BAP Organic Fertilizer Granules (Gypsum & Dolomite based soil conditioner). Also contains hormones necessary for plant growth.	Soil conditioner: Fluvic acid and Humic acid of BAP enhance the growth of plant, and increase the number of stems and flowers. BAP can be used for all crops.
7	Chelated Micro Nutrients:	Provides essential micro-nutrients to plants
8	GEOGREEN	Organic compost soil conditioner
9	Power-K (Organic Potash Manure)	Widely used for the crops to enhance potash level.
10	Humic Acid	It includes peat, seaweed, guano, humic acid, slurry and worm castings.

**Table 5: NSSC enlisted companies for import of bio-fertilizers**

<b>No.</b>	<b>Name of Business House</b>	<b>Contact address</b>
1.	T. Stanes & Company limited.	8/23-24 race Course Road, Coimbatore-641018, India. Tel: + 91-422-222 1514, 222 3515-3518. Fax: + 91422-222 0432, 222 0857. R&D: <a href="mailto:tscrc@t-stanes.com">tscrc@t-stanes.com</a> . Website: <a href="http://www.tstanes.com">www.tstanes.com</a> .
2.	National Fertilizers Limited (NFL). Corporate Office	A-11, Sector-24, Noida- 201301 (UP) EPABX NOS.: 0120-2412294, 2412445, 3292201-08, FAX No: 0120-2412397. Registered Office: Scope Complex, Core-111, 7, Institutional Area, Lodhi Road, New Delhi -110003. Phone: 011-24360066. FAX: 011-24361553
3.	Redox Industries Limited	Janak S. Dhameliya (CEO) B/411, Signature 2, Opposit Relief Hotel, Sarkhej Sanand Road, Sarkhej, Ahmedabad - 382210, Gu•arat, India.
4.	Rallis India Limited	156/157, 15th Floor, Nariman Bhavan, 227, Nariman Point, Mumbai 400 021. +91 - 022 - 6665 2700/+91 022 - 6665 2860. 2nd Floor, Sharda Terraces, Plot No. 65, Sector 11 CBD Belapur, Navi, Mumbai 400 614. +91 - 022 - 6776 1700.
5.	Yash Organics	Pankaj Nikumbh (Director) Basement No. 1, Akshardham Apartment, Pethphata, Opposite Gulab Baug, Panchavati Nashik - 422003, Maharashtra, India.
6.	Multiplex	Multiplex Bio-Tech Pvt.Ltd. #180, 1 <sup>st</sup> Main Road, Mahalakshmi Layout, Bangalore - 560086.India. Tel: 080-23497464, 23494406, 23497360, Fax:080-23490647, E-mail: Website: <a href="http://www.multiplexou.com">www.multiplexou.com</a>
7.	Inoculants Production Facility	BNF Resource Centre, Thai Dept. of Agriculture, Thailand.
8.	Phayachangthongnetwork company limited	587 M.I I Nongphai, Nongphai, Petchaboon 67140 Thailand, Business type: Distribute, sell Phayachangthong organic fertilizers, Tel: +6656781284, Mobile +66 85 800 8234, Fax: +6656781283.