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FARMERS' PARTICIPATION IN PESTICIDE FREE PADDY PRODUCTION THROUGH ADOPTION OF GREEN FARMING MODEL WITH INHANA RATIONAL FARMING TECHNOLOGY - A CASE STUDY FROM BIRBHUM, WEST BENGAL, INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Author AKB led the field experiments; farmer's training and awareness program while author RB monitored the project, did the documentation, laboratory analysis and performed the statistical calculations. Author AS managed the literature searches and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Industrial agriculture that relies heavily on synthetic inputs has led to the depletion of soil health, pest/ disease virulence and increased crop vulnerability especially under the climate change impact that ultimately threaten the farmers' livelihood. The Green Farming Initiative through the utilization of Inhana Rational Farming (IRF) Technology was a collaborative undertaking of the Department of Agronomy, Visva-Bharati University (Santiniketan) and Inhana Organic Research Foundation (IORF, Kolkata) to motivate farmer's interest towards pesticide free crop production and to establish a direct producer- consumer linkage for enabling value added end product at conventional price. Findings from the project indicated that 'Plant Health Management' accompanied by 'Soil Health Management' using on-farm produced Novcom compost can enable higher crop production. Also pesticide residue testing and 3rd party certification can help in value added marketing and establishing consumer connects, that can facilitate better farmers' livelihood.

Keywords: Plant health; Novcom compost; IndGAP certification; value added marketing.

1. INTRODUCTION

Agriculture in Birbhum is plagued by a lot of bottlenecks including limiting soil conditions and extreme climate. And conventional farming has further depleted the resource productivity. Agriculture in this region is dominated by the resource poor marginal farmers, who are in urgent need of pathways that can secure their livelihoods. In this background Inhana Rational Farming (IRF) Technology- a comprehensive organic package of practice showed promising results under varied test crops both under i) Organic and ii) Green Farming Model [1,2,3,4]. These 'Sustainable Agriculture Models' have been developed keeping resource availability (*for on- farm compost production in adequate quantity that is pre-requisite for effective organic soil management in an economical manner*) and socio-economic framework

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in the background. Under organic farming, there is 100 percent elimination of all synthetic inputs and organic management is undertaken in respect of the soil and plant. However, under the green farming model, organic plant health management is undertaken along with 100 percent elimination of synthetic pesticides, while soil management is done in an integrated mode based on the on- farm resource availability to enable quality compost production in an economical manner. In both the cases the objective of 'Plant Health Management' is to nourish the plants towards improving their nutrient uptake efficiency, self- immunity and resilience against biotic and abiotic stress factors [5].

The project was a collaborative initiative of the Department of Agronomy, Visva- Bharati University, Santiniketan and Inhana Organic Research Foundation (IORF, Kolkata) to encourage nature friendly climate resilient agriculture through direct farmers' participation with funding assistance from NABARD, Kolkata. Green farming model was primarily selected due to scarcity of raw materials for on-farm compost production. Considering that the community mainly comprised resource poor marginal farmers taking up organic soil management (that is essential for organic farming) especially on a large scale is a difficult proposition.

2. MATERIALS AND METHODS

The study area was located in Ruppur Gram Panchayat under Bolpur Block, Birbhum District of West Bengal. The program was initiated in the year 2017 with an awareness development program for the local farmers regarding the importance of 'Sustainable Farming' practices. Post the awareness program, progressive farmers (Table 1; Pictures 1 and 2) were selected for the project where Green Farming Model was used to demonstrate sustainable paddy cultivation (using Gobindobhog and Banskathi paddy varieties) through the utilization of Inhana Rational Farming (IRF) Technology. The results from the green farming plots were compared with the data from the farmers' field that were cultivating the same paddy varieties under conventional practice in that same zone.

2.1 Inhana Rational Farming Technology

Inhana Rational Farming (IRF) Technology, developed by an Indian Scientist and Pioneer of sustainable organic tea production in India - Dr. P. Das Biswas; has a wholistic approach towards the ecosystem components like the soil, plant and the environment and strives to strike a balance among the ecosystem functions [4]. It provides the right environment for all the components, be it plant or soil, which leads to ecological improvement thereby ensuring economic sustainability [6]. The technology works towards (i) energization of soil system i.e., to enable soil to function as an effective growth medium for plants and (ii) energization of the plant system i.e., to enable efficient utilization and assimilation of nutrients, improvement of self- immunity, and enhancement of biochemical and structural defenses leading to activation of the plants' host defense mechanism [7].

2.2 Inhana Green Farming Model

Under green farming model, IRF Technology was utilized for organic plant health management along with 100 percent elimination of synthetic pesticides, while integrated soil management was done based on the on- farm resource availability for compost production. Under this model, soil analysis of the respected field was done before the cultivation to evaluate the soil fertility status and accordingly the nutrient requirement was calculated. Then further study was done to assess the capacity of the concerned farmers to generate raw material for on-farm composting using Novcom composting method. Here under the study compost could be applied @ 7.5 ton /ha. Then a schedule was given starting from seed treatment to soil and plant health management in nursery and main field as per the protocol of IRF Technology. No synthetic inputs for plant management were allowed under this model. The process itself reduced pest interference and whatever occurred could be effectively controlled using alternate pest management options *viz.* neem-karanj oil based formulations, on-farm herbal concoctions etc.

2.3 Production of Novcom Compost

Novcom compost was produced in the village (Picture 3) using farm waste, water hyacinth and fresh cow dung (80:20 ratio) utilizing Novcom composting method [8]. The compost attained maturity within 21 days as indicated by the earthy smell and brownish coloration, further confirmed by the maturity and phytotoxicity analysis in the laboratory.

2.4 Green Farming under Inhana Rational Farming Technology

Organic plant management under Inhana Rational Farming Technology was undertaken as per the schedule provided by Inhana Organic Research Foundation. The protocol was initiated from organic seed bed by giving two sprays of Inhana 'Energy' solutions namely IB (Ag)– I and IB (Ag)– II at an

interval of 10 days. Before transplanting into the main field, the seedlings were immersed in root deep water mixed with Inhana Seed Solution II, for nearly 1 hour. This was done to limit or erase out the possibility of any seed borne diseases and to initiate better growth from the beginning.

Picture 1. Classroom training program for the project farmers regarding the knowhow of green farming in the study area

Picture 2. Mr. A. K. Roy Barman, CGM, NABARD, Mr. Sumortho Ghosh, DDM, Birbhum District, NABARD with Dr. A.K. Barik, PI & Head, Department of Agronomy, Visva-Bharati University along with project farmers in one of the awareness development program for pesticide free crop production

Table 1. Details of progressive farmers associated with the project

Sl no	Farmers name	Area (ha)	Sl no	Farmers name	Area (ha)
Area under Green farming			**Area under Green farming**		
1.	Adhir Gorai	1.60	15.	Sadhan Ghosh	0.13
2.	Khudiram Gorai	0.20	16.	Nimai Ghosh	0.13
3.	Narayan Gorai	0.13	17.	Pratik Roy.	0.13
4.	Kashinath Das	0.13	18.	Tapas Ghosh	0.53
5.	Chandicharan Kora	0.20	19.	Dilip Ghosh	0.20
6.	Sadananda Das	0.13	20.	Swapan Ghosh	0.20
7.	Satyagopal Gorai	0.13	21.	Goutam Choudhury	0.13
8.	Sibu Koibarta	0.13	22.	Amiyo Ghosh	0.40
9.	Hriday Koibarta	0.13	23.	Nirmal Ghosh	0.27
10.	Arun Koibarta	0.13	24.	Uttam Mondal	0.13
11.	Nanda Gorai	0.33	25.	Bijay Mondal	0.13
12.	Prabodh Das	0.13	26.	Saber Ali Molla	0.13
13.	Hemanta Ghosh	0.13	27.	Abul Alam	0.13
14.	Tapan Ghosh	0.27	28.	Laskar Mandi	0.27

Address: Ruppur Gram Panchayat, Bolpur, Sriniketan Block, District Birbhum, West Bengal, India

Table 2. Different solutions under Inhana plant health management package for paddy cultivation

Sl. no	Solution name	Dose & Dilution	Growth stage (time of application)
Organic Seed Bed Management			
1.	IB (Ag) - I	200 ml/litre of water	3 days after germination
2.	IB (Ag) -II	200 ml/litre of water	10 days after 1st spray
3.	Seed solution II	200 ml/5 litre of water	Uprooted seedlings ready for transplantation
Organic Paddy Management (Post Transplantation)			
1.	IB (Ag)- 1	1.50 ltr/ha	7 days after transplanting.
2.	IB (Ag)-2+IB(Ag)- 7	(1.5 ltr + 1.5 ltr)/ ha	10 days after 1st spray in main field.
3.	IB (Ag) - 5	1.50 ltr/ha	10 days after 2nd spray in main field.
4.	IB (Ag) - 2	1.50 ltr/ha	20 days after 3rd spray in main field.
5.	IB (Ag)- 3	1.50 ltr/ha	10 days after 4th spray in main field.

Picture 3. Project farmers participate in training and demonstration program of on-farm composting with available farm resources under Novcom composting method

Table 3. Details of the solutions for plant health management and their respective role in plant physiological development

Sl. no	Solution name	Biologically activated & potentised extract of	Role in plant physiological development
1.	IB (Ag) - I	*Ficus hispida Linn.*	Initiation of metabolic resources during germination.
2.	IB (Ag) -II	*Erythrina Variegate Linn.*	Faster independence of seedling from the seed reserve.
3.	Seed solution III	*Calotropic procera R.* & *Tinospora crispa*	Photosynthesis enhancement and increased uptake of organic and inorganic solutes through roots.
4.	IB (Ag)- 1	*Hyoscyamus niger*, *Ficus benghalensis* & *Dendrocalamus strictus Nees*.	Organic growth promoter, activator and regulator 1. Energizes and stimulates the plants system for the best use of inputs both applied and stored in the soil. 2. Regulates every stage of the Grand Growth Period influencing growth correlation.
5.	IB (Ag)- 2	*Ocimum sanctum*, *Calotropic procera R.* & *Cynodon dactylon*	Silica induced immunity against fungal attack 1. Activates plant's host defense mechanism through silica mgt. against fungal pathogens providing structural defense. 2. It also stimulates plants Immune System by activating the biosynthesis of different phenolic compounds having fungi-toxic property.
6.	IB (Ag) - 3	*Adhatoda vasica Nees*, *Zingiber officinale Roscoe* & *Embellia ribs.*	Organic solution for potash absorption and utilization 1. Increases the efficiency of potash uptake through energized root capacity & gradual reduction in the application is ensured. It activates suction pressure by influencing diffusion pressure deficit.
7.	IB (Ag) - 5	*Cynodon dactylon* & *Calotropic gigantean.*	Energizes the various biochemical process of the plant resulting in harmonious grand growth period. 1. Regulates and stimulates the cellular oxidation process. 2. Energizes the phloemic function resulting in encouraged translocation of organic solutes. Stimulates the hydrolysis of starch to D-Glucose units by enhancing the enzymatic activity.
8.	IB (Ag)- 7	*Ocimum sanctum*	Stimulates the root function, activates the root growth and penetration and energizes the soil in the root zone thus improves the soil-plant relationship. 1. Developes the CEC of the soil. 2. Energizes the production of micro-flora and bio-flora around the root zone. 3. Improves the degree of base saturation to the desired level. Enhances the Root Cation Exchange Capacity. Stimulates the root growth and penetration by activating the Contact Exchange Capacity of the Root.

2.5 Conventional Farmers' Practice

In the conventional farmers' field, total NPK was applied (NPK : 60 : 30 : 30 kg/ha) in the form of urea, single super phosphate and muriate of potash. While under green farming; Novcom compost was applied @ 7.5 ton /ha along with NPK @ 30:15:15 kg/ha (50 % of recommended dose). Standard management practice was followed for nursery development, soil preparation, management in main field till the harvesting of end products.

2.6 Agronomic Data Collection

The necessary data required for the study were recorded from ten randomly selected hills (each plant) from each farmer's field. Paddy yield from individual farmers' field was documented after harvesting and

Picture 4. Pesticide free paddy production under green farming through the utilization of IRF technology in the study area

processing (cleaning and sun drying). For comparative study, yield of same paddy variety in that zone under conventional farmers' practice was also documented. The data were interpreted with statistical analysis viz. standard error and Duncan's multiple range test (MRT) using statistical package SPSS 11.5.

3. RESULTS AND DISCUSSION

3.1 Evaluation of Novcom Compost Quality

Samples from the on- farm produced compost was examined for its quality (Table 3). Average moisture in compost samples varied from 55.80 to 66.07 percent which was higher than the standard reference range (40 to 50 percent) [9]. With a pH of 7.79 the compost qualified to be good and matured [10]. Total nutrient content in the compost (3.94 to 4.84 percent) was found to be high as compared to any other green matter compost. The ratio of available Carbon (C) to Nitrogen (N) is a critical parameter for biodegradation and in most finished compost products, it is between 12 and 20 [11]. Hence, the C/N ratio of 14: 1 indicated that the compost was matured and within the ideal suggested range of 12–18 [12]. The total count for bacteria, fungi and actinomycetes (expressed in $\log_{10}$ value) in final compost was 14.854 to 15.279. Such high population of microbes generated naturally only due to presence of an ideal micro-atmosphere within the composting heap as influenced by the application of Novcom solution [8]. Mean respiration or CO_2 evolution rate of all compost samples (2.31 to 3.57 mgCO_2–C/g OM/day) was more or less within the stipulated range (2.0 - 5.0 mgCO_2–C/g OM/day) for stable compost [13,14]. For Germination index, the mean test value (0.96) indicated absence of phytotoxic effect in the final compost, as per the standard suggested by Trautmann and Krasny [13].

3.2 Yield Attributing Agronomic Traits

The parameters that directly accounts for yield are the manifestation of plant's physiological functioning along with its interaction with soil components. The major yield components of paddy comprises the number of panicles per unit area, number of grains/ panicle, grain filling percentage and individual grain weight (normally expressed as 1000-grain weight). The rate of panicle-bearing tillers influences the grain yield of rice [15] and formation of lowly productive tillers is considered an investment loss to the plant [16]. Productive panicles were 216.2 and 279.4 per m^2 respectively for Gobindobhog and Banskathi paddy varieties (Table 5). Number of filled grains/ panicle was highest (288.0) under Banskathi followed by Gobindobhog variety (181.2). 1000 grain weight was also highest (21.06 gm) for Banskathi as compared to Gobindobhog variety (11.62 gm).

3.3 Crop Performance under Green Farming

Paddy yield in individual farmer's plot was documented after harvesting and processing (cleaning and sun drying). For comparative study, yield of same

Table 4. Quality parameters of Novcom compost produced in Farmers' Field at Birbhum, West Bengal, India

Sl. no.	Parameter	Novcom Green matter compost		
		Range value	Mean	± Std. error
1.	Moisture percent (%)	55.80 – 66.07	64.10	± 3.11
2.	pH_{water} (1 : 5)	6.60 – 8.03	7.79	± 0.33
3.	Organic carbon (%)	26.20 – 29.40	28.30	± 1.80
4.	Total NPK (%)	3.94 – 4.84	4.23	± 0.21
5.	C/N ratio	13:1 – 16:1	14:1	± 0.41
6.	Total bacterial count[1] (Log_{10} value)	15.011 -15.451	15.281	± 1.01
7.	Total fungal count[1] (Log_{10} value)	14.844 – 15.004	14.901	± 0.84
8.	Total actinomycetes count[1] (Log_{10} value)	14.106 – 14.853	14.634	± 0.73
9.	CO_2 evolution rate (*$mgCO_2$ – C/g OM/day)*	2.31 - 3.57	2.79	± 0.14
10.	Germination index *(phytotoxicity bioassay)*	0.89 – 1.02	0.96	± 0.03

[1]*Microbial count: c.f.u. per gm moist compost*

Table 5. Agronomic parameters related to yield components of different paddy varieties (before harvesting) under Green Farming at Birbhum, West Bengal, India

Agronomic parameters of paddy under green farming	Paddy variety (Gobindobhog)			Paddy variety (Banskathi)		
	Range value	Mean value	Std. error	Range value	Mean value	Std. error
Plant height (cm)	134.5 - 154.6	148.2	± 2.83	121.5 - 138.4	124.8	± 4.01
Hills/m^2	23 - 25	24.2	± 2.01	26 - 28	27.00	± 2.04
No. of tillers/hills	18 – 23	20.2	± 0.62	27 - 31	28.3	± 0.71
No. of panicle/hills	11 - 15	13.1	± 0.43	18 - 22	20.2	± 0.31
Panicles/m^2	289 - 348	314.4	± 7.27	319 - 357	327.7	± 8.41
Productive panicle/m^2	208 - 264	216.2	± 5.01	274 - 287	279.4	± 9.11
Panicle length (cm)	22.41 - 25.68	23.94	± 1.20	21.32 - 25.50	23.10	± 1.31
No. of grains/panicle	202 - 234	219.6	± 6.01	321 - 342	332.0	±7.01
Filled grains/panicle	167 - 188	181.2	± 5.10	266 - 295	288.0	± 7.54
Unfilled grains/panicle	35 - 46	38.4	± 1.11	47 - 55	44.00	± 2.43
1000 grains wt.(g)	11.51 - 11.74	11.62	± 0.09	20.64- 21. 68	21.06	± 0.95

Table 6. Crop performance in farmers' field under green farming and conventional farmers' parctice, at Birbhum, West Bengal, India

Name of Farmers	Crop Performance in Farmers' Field	
	Average Yield in Green Farming Plots	Average Yield in Conventional Farmers Practice*
Variety: Gobondobhog		
Adhir Gorai, Sadhan Ghosh, Khudiram Gorai, Narayan Gorai, Pratik Roy, Kashinath Das, Chandicharan Kora, Dilip Ghosh, Sadananda Das, Satyagopal Gorai, Goutam Choudhury, Sibu Koibarta, Amiyo Ghosh, Hriday Koibarta, Nirmal Ghosh, Uttam Mondal, Nanda Gorai, Bijay Mondal, Prabodh Das, Tapan Ghosh	Varied from 3365 kg/ha to 4020 kg/ha Mean 3960 kg/ha	Varied from 3000 kg/ha to 3750 kg/ha Mean 3640 kg/ha
Variety: Banskathi		
Tapan Ghosh, Saber Ali, Pratik Roy, Hemanta Ghosh, Hrday Kobarta, Adhir Gorai, Nanda Ghosh, Abul Alam	Varied from 4560 kg/ha to 5620 kg/ha Mean 5120 kg/ha	Varied from 4210 kg/ha to 5200 kg/ha Mean 4830 kg/ha

**Data of conventional paddy yield taken from the surrounding areas during the same season*

paddy variety in that zone under conventional farmers' practice was also documented. In the case of Banskathi variety maximum grain yield was observed under green farming (4560 kg/ha to 5620 kg/ha with mean value of 5120 kg/ha.) as compared to the plots receiving chemical treatment (4210 kg/ha to 5200 kg/ha with a mean value of 4830 kg/ha) (Table 6). However, in the case of Gobindobhog variety, grain yield under green farming (3365 kg/ha to 4020 kg/ha with mean value of 3960 kg/ha) was significantly higher than the yield obtained under chemical cultivation practice (3000 kg/ha to 3750 kg/ha with mean value of 3640 kg/ha).

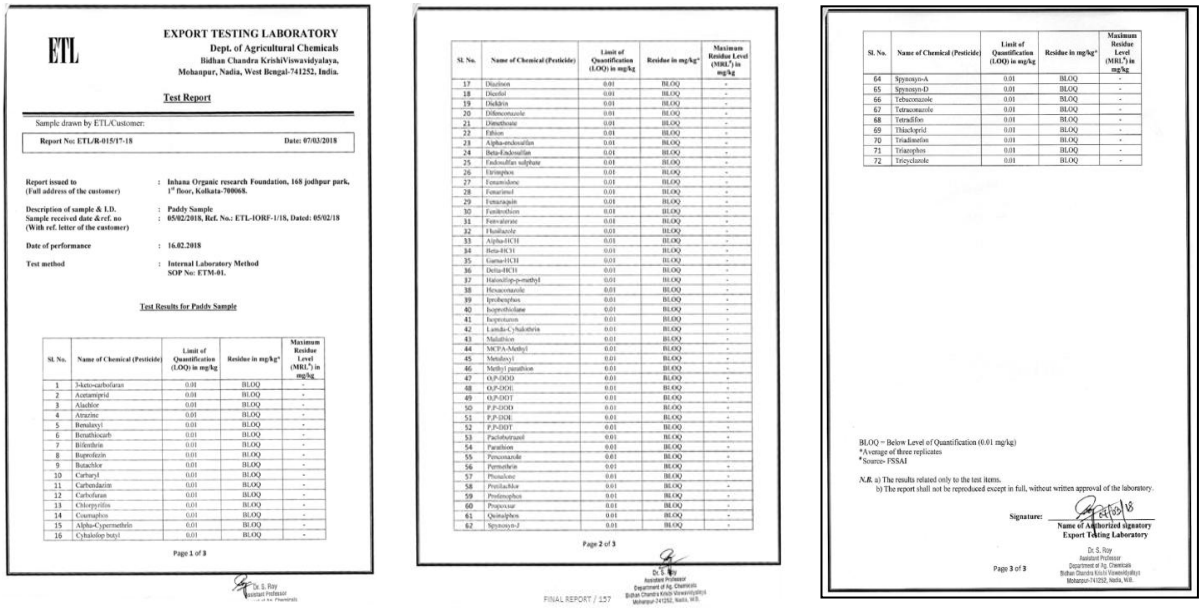
The study indicated the effectiveness of the green farming model towards sustainable- low input paddy production. Such encouraging results could be primarily attributed to the unique approach of plant health management under IRF Technology, which is a first of its kind; and secondly to Novcom compost which helped out in undertaking integrated soil management in an efficient manner, due to its high quality and huge population of self- generated microbes. The findings indicated that the 'Green Farming Model' utilizing IRF Technology can ensure crop sustainability even under the complete elimination of pesticides and reduction of chemical fertilizer; due to higher agronomic efficiency and effective pest management through plant health management.

3.4 Pesticide Residue Analysis for End Product Purity

As per the protocol of green farming, synthetic pesticides were completely eliminated from the cultivation practice. However, to confirm the purity of end product, samples were sent to the Export Testing Laboratory, Department of Agricultural Chemicals, Bidhan Chandra Krishi Viswavidyalaya, West Bengal (India). Paddy samples were tested for 72 commonly used chemicals in Indian agriculture and the results indicated the complete absence of all the tested chemicals (Fig. 1).

3.5 IndGAP Certification to Ensure Consumer Connect

Value addition in the end product enables better consumer reach and ensures economic sustainability both at the consumer and producer levels. As per the project mandate, we opted for 3rd Party Certification and achieved the 'IndGAP Certificate' (*1st such initiative in rice*) to boost up Consumers' Confidence and enable better marketability. We branded the pesticide free end product in the name of 'Arkodhara' and packed the rice in reusable plastic containers for better marketability. Most importantly the end product was priced within the conventional price range. This concept of IndGAP Certified - Pesticide Free End Product, happened to be the 1st of its kind Marketing; Pan India.



ETL

EXPORT TESTING LABORATORY
Dept. of Agricultural Chemicals
Bidhan Chandra KrishiViswavidyalaya,
Mohanpur, Nadia, West Bengal-741252, India.

Test Report

Sample drawn by ETL/Customer:

Report No: ETL/R-015/17-18 Date: 07/03/2018

Report issued to (Full address of the customer) : Inhana Organic research Foundation, 168 jodhpur park, 1st floor, Kolkata-700068.

Description of sample & I.D. Sample received date &ref. no (With ref. letter of the customer) : Paddy Sample : 05/02/2018, Ref. No.: ETL-IORF-1/18, Dated: 05/02/18

Date of performance : 16.02.2018

Test method : Internal Laboratory Method SOP No: ETM-01.

Test Results for Paddy Sample

Sl. No.	Name of Chemical (Pesticide)	Limit of Quantification (LOQ) in mg/kg	Residue in mg/kg*	Maximum Residue Level (MRL*) in mg/kg
1	3-keto-carbofuran	0.01	BLOQ	-
2	Acetamiprid	0.01	BLOQ	-
3	Alachlor	0.01	BLOQ	-
4	Atrazine	0.01	BLOQ	-
5	Benalaxyl	0.01	BLOQ	-
6	Benathiocarb	0.01	BLOQ	-
7	Bifenthrin	0.01	BLOQ	-
8	Buprofezin	0.01	BLOQ	-
9	Butachlor	0.01	BLOQ	-
10	Carbaryl	0.01	BLOQ	-
11	Carbendazim	0.01	BLOQ	-
12	Carbofuran	0.01	BLOQ	-
13	Chlorpyrifos	0.01	BLOQ	-
14	Coumaphos	0.01	BLOQ	-
15	Alpha-Cypermethrin	0.01	BLOQ	-
16	Cyhalothrin butyl	0.01	BLOQ	-

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Dr. S. Roy
Assistant Professor

Sl. No.	Name of Chemical (Pesticide)	Limit of Quantification (LOQ) in mg/kg	Residue in mg/kg*	Maximum Residue Level (MRL*) in mg/kg
17	Diazinon	0.01	BLOQ	-
18	Dicofol	0.01	BLOQ	-
19	Dieldrin	0.01	BLOQ	-
20	Difenconazole	0.01	BLOQ	-
21	Dimethoate	0.01	BLOQ	-
22	Ethion	0.01	BLOQ	-
23	Alpha-endosulfan	0.01	BLOQ	-
24	Beta-Endosulfan	0.01	BLOQ	-
25	Endosulfan sulphate	0.01	BLOQ	-
26	Etrimphos	0.01	BLOQ	-
27	Fenamidone	0.01	BLOQ	-
28	Fenarimol	0.01	BLOQ	-
29	Fenazaquin	0.01	BLOQ	-
30	Fenitrothion	0.01	BLOQ	-
31	Fenvalerate	0.01	BLOQ	-
32	Fipabenole	0.01	BLOQ	-
33	Alpha-HCH	0.01	BLOQ	-
34	Beta-BCH	0.01	BLOQ	-
35	Gama-HCH	0.01	BLOQ	-
36	Delta-BCH	0.01	BLOQ	-
37	Halosulfop-p-methyl	0.01	BLOQ	-
38	Hexaconazole	0.01	BLOQ	-
39	Iprobenphos	0.01	BLOQ	-
40	Isoprothiolane	0.01	BLOQ	-
41	Isoproturon	0.01	BLOQ	-
42	Lamda-Cyhalothrin	0.01	BLOQ	-
43	Malathion	0.01	BLOQ	-
44	MCPA-Methyl	0.01	BLOQ	-
45	Metalaxyl	0.01	BLOQ	-
46	Methyl parathion	0.01	BLOQ	-
47	O,P-DDD	0.01	BLOQ	-
48	O,P-DDE	0.01	BLOQ	-
49	O,P-DDT	0.01	BLOQ	-
50	P,P-DDD	0.01	BLOQ	-
51	P,P-DDE	0.01	BLOQ	-
52	P,P-DDT	0.01	BLOQ	-
53	Paclobutrazol	0.01	BLOQ	-
54	Parathion	0.01	BLOQ	-
55	Penconazole	0.01	BLOQ	-
56	Permethrin	0.01	BLOQ	-
57	Phenalone	0.01	BLOQ	-
58	Pretilachlor	0.01	BLOQ	-
59	Profenophos	0.01	BLOQ	-
60	Propoxur	0.01	BLOQ	-
61	Quinalphos	0.01	BLOQ	-
62	Spinosyn-J	0.01	BLOQ	-

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Sl. No.	Name of Chemical (Pesticide)	Limit of Quantification (LOQ) in mg/kg	Residue in mg/kg*	Maximum Residue Level (MRL*) in mg/kg
64	Spinosyn-A	0.01	BLOQ	-
65	Spinosyn-D	0.01	BLOQ	-
66	Tebuconazole	0.01	BLOQ	-
67	Tetraconazole	0.01	BLOQ	-
68	Tetradifon	0.01	BLOQ	-
69	Thiacloprid	0.01	BLOQ	-
70	Triadimefon	0.01	BLOQ	-
71	Triazophos	0.01	BLOQ	-
72	Tricyclazole	0.01	BLOQ	-

BLOQ = Below Level of Quantification (0.01 mg/kg)
*Average of three replicates
*Sources- FSSAI

N.B. a) The results related only to the test items.
b) The report shall not be reproduced except in full, without written approval of the laboratory.

Signature:
Name of Authorized signatory
Export Testing Laboratory

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Dr. S. Roy
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Mohanpur-741252, Nadia, W.B.

Fig. 1. Pesticide analysis report, Export Testing Laboratory, Department of Agricultural Chemicals, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India


Certificate of Conformity

Issued to

Inhana Organic Research Foundation
(168, Jodhpur Park,1st Floor, Kolkata, West Bengal, India)

WELTWEIT CERTIFICATIONS PRIVATE LTD declares that the production of the products mentioned in this certificate has been found to be compliant in accordance with standard IndGAP

The annex contains details of the products and producers and the packing house assigned to this certificate

DINESH K MENON

Certification:

IndGAP
Option-2

Certification Decision: 22/03/2018
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Picture 5. Inauguration of "Arkadhara' – India's 1st 100% residue free IndGAP Certified Rice Brand – an effort to develop a Direct and Steady Supply Chain of Green farming produce from farmers to consumers

4. CONCLUSION

Better crop yield and initiative towards value added marketing has generated farmers' interest towards sustainable paddy cultivation under Green Farming Model and they wish to take it up on a larger scale. Moreover, the scientific outcomes from the project and this sustainable agriculture model can be replicated in other crops as well, towards development of the farmers' livelihood. The study reflects how adoption of green farming can ensure gradual reduction in the dependence on chemical fertilizers (depending upon the resource availability for on- farm compost generation) and help out in completely eliminating pesticides at a go, without facing the threat of crop loss.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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