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In coordination with
The Agriculture and Fisheries Information Service (AFIS)
Department of Agriculture

PROTOCOL

DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS AND WATER MANAGEMENT

Note: *Every ton of harvested inbred rice corresponds to 2 tons of rice straw. In cases of hybrid rice, one tone harvest corresponds to one ton rice straw*

- If drying of rice straw occurs, step upon the rice straw for them to become submerged in water.

- Wet the rice straw frequently to hasten its decomposition.

III. INITIATION OF MARKET NICHE-DRIVEN PURE ORGANIC FARMING

- This is another major activity to push some initiatives to develop and improve plants that fix atmospheric nitrogen (N) to augment the supply of inherent soil N. This program will also include the promotion of bio-gardens, emphasize low external input, and market niche driven farming system. Pure organic farming will provide a policy for the recall and massive production of certified varieties such as Azucena, Wagwag, Dinorado, and other fancy rice in the uplands or rainfed ecosystem that are acceptable and competitive in the world market.

II. RAPID RICE COMPOSTING AND NUTRIENT RECYCLING "BALIK PATABA SA BUKIRIN"

- Rapid rice composting is the production of on-farm composting using rice straw with the aid of *Trichoderma*, a fungus that hasten the decomposition of biomass or farm wastes. *Trichoderma* is also effective in decomposing lignocelluloses like corn stalks, sugarcane bagasses, grasses and weeds.

- Compared with the traditional or natural method of composting which takes about three to four months to make. The use of *Trichoderma* accelerates the decomposition of rice straw in just three to four weeks.

- The *Trichoderma* fungus is also known as Compost Fungus Activator (CFA). It is available in powder or granular form. Lately, pure culture contained in agar-oatmeal medium has been found to be more convenient and practical to use with similar effectiveness in hastening decomposition.

- The old method of rice composting using *Trichoderma* is done through file method. This method, however, is laborious. Thus, new practical method is recommended for irrigated rice farms.

COMPOSTING PROCEDURES TO REMEMBER IN IRRIGATED FARMS

- Spread the rice straw in rice paddy together with 500 kg of dried chicken manure (or its equivalent commercial organic fertilizer) within a month before plowing.

Note: *Dried farm manure (pig, carabao or cattle) and plants with high N content such as ipil-ipil, azolla, sesbania, mungo, mani, cowpea, soybean, kakawate(madre de cacao), acasia etc. . Rice straw after threshing could be spread in rice paddy immediately while waiting for the release of irrigation water.*

- Allow water to flow into the paddy and soak the rice straw within 12 hours. Be sure the farm ditch is closed. Leave the rice straw moist until decomposed.

- Mix the right amount of Trichoderma in a knapsack sprayer according to yield (4 bottles of trichoderma for every ton of rice straw). Spray evenly to rice straw in the paddy.

I. INTRODUCTION

At present, prices of inorganic fertilizers, especially ***Urea*** are increasing at the rate that impedes the gains obtained from crop improvement programs.

Most farms in the Philippines are heavily dependent on inorganic fertilizers (to the extent that our concept of high yield for a given cropping season will only be attained using these external inputs) while farm wastes are improperly managed and nutrient management strategies are not widely applied in many parts of the country. These practices have placed the farmers in the chain of debt burden from traders who finance their production inputs.

One of the best options is Organic Based Agriculture-Development Program ***(Agri-Kalikasan)***. It is a science-based sustainable agricultural and rural development program that advocates the implementation of organic-based farming guided by scientific principles. It promotes safe and judicious use and proper mixtures of oil-based chemical fertilizers; recycled composted home and farm wastes and other forms and natural sources of soil ameliorants and organic fertilizers. This program is the primary DA strategic cost-reduction, environment-friendly food production measure that aims to reduce the dependence of vulnerable small farmers on chemical-based fertilizers.

II. OBJECTIVES

The program aims to establish a cost-efficient, competitive and sustainable agricultural production system that is in harmony with nature and ensure long-term economic farm productivity and natural resource-base productivity by mainstreaming organic-based farming into the DA's sustainable agricultural development programs that reduces vulnerability of small farmers to the uncontrolled prices of chemical fertilizers.

III. SCOPE

1. **Balanced and judicious Organic-based farming "*Tipid -Abono*"**

   ♦ This is a technology intervention, which promotes the balanced and judicious use of organic and inorganic combination of fertilizers to address the increasing cost of oil-based fertilizers and the need to sustain the target

yield for rice and corn for national food security in a long term cost-efficient and sustainable development.

2 Rice Composting and Nutrient Recycling "*Balik Pataba sa Bukirin*"

♦ This program component focuses on the production of on-farm compost using rice straw with the aid of Trichoderma, a fungus that hastens the decomposition of biomass or farm wastes in designated GMA cluster production areas.

3 Initiation of Market Niche-driven Pure Organic Farming

♦ Encourage the expansion of alternative pure organic upland and rainfed farming technology, low external input system that develop special organic products that conform with the Philippine National Standards for Organic Agriculture.

IV. COLLABORATING AGENCIES

The Organic based Agriculture-Development Program *(Agri-Kalikasan)* is an undertaking of the Department of Agriculture with the Bureau of Soils and Water Management as the primary implementing agency. This program involves the collaboration of government agencies and private sector such as the National Agriculture and Fishery Council (NAFC), the GMA Program Directorate, Fertilizer and Pesticide Authority (FPA), Agriculture and Fishery Information System (AFIS) , Department of Agriculture-Regional Field Units, Philippine Rice Research Institute (PHILRICE), Bureau of Agriculture and Fishery Product Standards (BAFPS), Bureau of Agricultural Research (BAR), Agricultural Training Institute (ATI), Bureau of Post Harvest Research and Extension (BPRE), Bureau of Plant Industry (BPI), Agribusiness and Marketing Assistance Section (AMAS), Land Bank of the Philippines, QUEDANCOR, Organic Fertilizer Producers and Organizations, and Organic Fertilizer Advocates.

PROGRAM COMPONENTS

PC 1. *Tipid Abono* and Balanced Fertilization Program

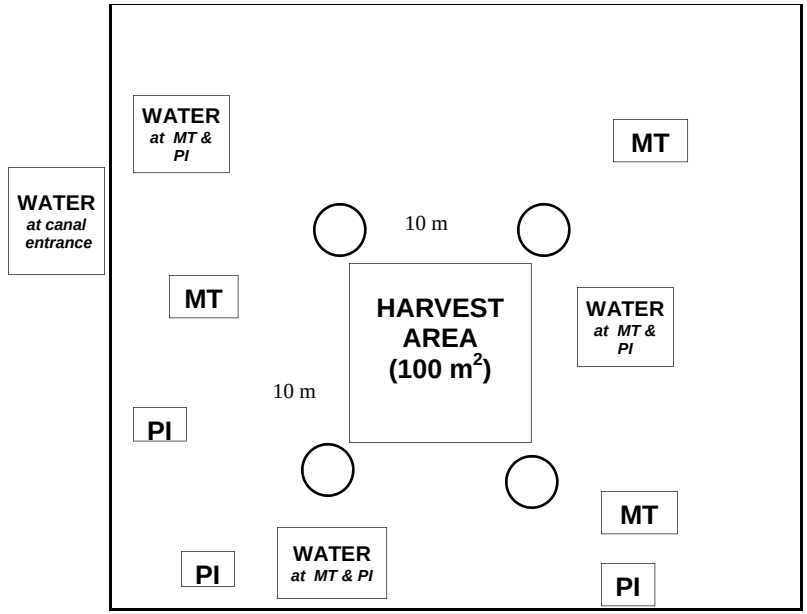
This program is the primary cost reduction strategy for food production, which promotes the judicious use and combination of organic and inorganic fertilizers to address the increasing cost of fertilizers while sustaining the targeted optimum yield for rice and

Table 9. Result of Leaf Color Chart (LCC) Monitoring

Date	Weekly Readings*	LCC Read-ing	Action Taken				Remarks
			Date Applied	DAS / DAT	Amount Applied	Kind of Fertil-izer	
	1st						
	2nd						
	3rd etc.						

* *weekly readings after 14 DAT or 21 DAS up to initial flo*wering

Figure 1. Sample Distribution of Sampling Points



Where to get Tiller Count (including soil and plant samples at harvest). Each sampling mark consist of 4 hills.

MT Soil & plant sampling at Mid-Tillering stage. Each sampling mark consist of 3 hills.

PI Soil & plant sampling at Panicle Initiation. Each sampling mark comsist of one hill

WATER Collect before planting at entrance of irrigation canal at MT & PI within the plot

Table 8b. **Comparative Rate of Production Inputs for Rice**

ITEM	Farmer-Cooperator/ Techno-demo (TD)		Non-Techno-demo (NTD)
	Before TAFP	During TAFP	
Material Inputs			
Seeds (kgs)			
variety			
Fertilizer (bags)			
Commercial Organic fertilizer			
Rice Straw			
14-14-14			
46-0-0			
18-46-0			
16-20-0			
21-0-0			
Zinc sulfate (if applicable)			
Others (specify)			
Fuel for land preparation (lid)			
Fuel for irrigation (lid)			
Insecticide			
Feticide			
Labor (days/ha)			
Operator & Family			
Hired			
Fixed Costs			
Landlord share			
Land tax			
Land rent			
Harvester/Thresher Share			
Irrigation Fee			
Other costs (specify)			
Total Cost - With Family Labor			
Total Cost - Without Family Labor			

corn to ensure national food security.

PC 2. Balik Pataba sa Bukiran (Rice Composting and Nutrient Recycling)

This program focuses on the production of on-farm compost using rice straw with the aid of *Trichoderma*, a fungus that hastens the decomposition of biomass or farm wastes, in designated GMA cluster production areas to only 21-28 days. To facilitate the implementation of activities, *Trichoderma* production facilities will be set-up in selected municipalities where model farms are located.

PC 3. Integrated Organic Based Model Farms

Establishment of a model farm for *Tipid–Abono* fertilization and massive composting for solid waste reduction and as alternate source of fertilizer especially for rural poor community. It will become a part of the community learning centers where there will be an exchange and sharing of information on organic-based farming among farmers, agricultural technicians, and the local academe. These model farms will have the following facilities:

- *Trichoderma* and Compost Production Facilities
- Post harvest infrastructure/facility

I. Tipid Abono Fertilization

The "*Tipid-Abono*" Fertilization Program is a cost reduction strategy through judicious and optimum fertilization, adopted by the Department of Agriculture to guide farmers, particularly the hybrid and certified rice producers, for using the right mixtures of fertilizers and the timely application of the most appropriate type and amounts of fertilizer that will ensure optimum crop yields and better income without causing decline in soil fertility. The TAFP also use the Leaf Color Chart (LCC) tool of PhilRice to help farmers visually assess the Nitrogen status and requirement of the rice plant at different growth stages. Time and amount of Nitrogen application is determined after LCC readings. As part of TAFP monitoring, soil analysis by Soil Test Kit (STK), Rapid Soil Test (RST) , and laboratory analysis are employed to confirm and determine *in situ,* soil nutrient status and plant nutrient uptake through plant tissue samples.

This cost reduction strategy is also employed to address the high and increasing cost of inorganic fertilizers which is dependent on escalating prices of crude oil.

The Program would ultimately provide primary measures to reduce cost of production and to sustain the increased farmers' income and savings obtained from the "Tipid Abono" fertilization. It will also support the small scale organic fertilizer industry and create job opportunities for about 6,000 persons per cropping season.

Expected results include: consistent yield of certified and hybrid seeds (5-7 tons/ha) despite reduction in the amount of fertilizer use; reduced production cost for rice and corn by 37-46 percent; savings of at least two (2) bags of urea/ha per year (1 bag/ha per cropping) and soil rehabilitation.

A. COLLABORATING AGENCIES

1. Department of Agriculture

- Reduce vulnerability of small farmers to the uncontrolled prices of chemical fertilizers by mainstreaming organic based farming in sustainable agricultural development programs.
- Establish cost-efficient, competitive sustainable agricultural production system that is in harmony with nature and ensure long-term economic farm productivity and natural resource base-productivity.

2. Bureau of Soils and Water Management

- Lead on-site selection for the Paddy Rice Composting and Nutrient Recycling Techno demo as a component of *Tipid-Abono* Fertilization Program
- Provide technical assistance in the implementation of the "*Tipid-Abono"* Fertilization Program (TAFP)
- Provide farmers the necessary inorganic fertilizers and other inputs for Paddy Rice Composting
- Monitor the progress of the program through its duly appointed Cluster Leader
- Ascertain that the project is carried out in accordance with the approved project implementing guidelines (protocol) and MOA
- Provide assistance on the analysis of soil, water, and plant tissue samples
- Provide soil fertility map or guide for national distribution of proper grade of fertilizer.
- Serve as the Secretariat for the TAFP

Table 8a. Comparative Cost and Return Analysis for Rice

ITEM	Farmer-Cooperator/ Techno-demo (TD)		Non-Techno-demo
	Before TAFP	During TAFP	(NTD)
No. Reporting			
Average Crop Area (ha)			
Yield (kg/ha)			
Total Production Value (PhP/ha)			
Production Cost - With Family Labor (PhP/ha)			
Production Cost - Without Family Labor (PhP/ha)			
Net Crop Income - With Family Labor (PhP/ha)			
Benefit Cost Ratio (BCR) With Family Labor			
Benefit Cost Ratio (BCR) Without Family Labor			

Table 7b. Yield data of techno-demo farmer cooperators

Name of farmer	Area (ha.)	Palay Yield at harvest		
		No. of bags	Ave. Wt. per bag	Total Wt. (kg)
1. 2. 3. 4. Etc.				
Total				
Ave.				

Adjusted average grain yield (kg/ha.) @ 14% M.C:

$$= \frac{\text{Total yield of farmer-cooperators (kg)}}{\text{Total harvest area (ha.)}} \times MF$$

Where: M.C. - moisture content of palay at harvest

M.F. (Moisture factor) $= \frac{100 - M.C.}{86}$

Table 7c. Farmers' practice (NTD)*

Name of farmer	Area (ha)	Palay yield at harvest		
		No. of bags	Ave. wt. Per bag	Total wt. (kg)
1. 2. 3.				
Total				
Ave.				

* Non Techno-demo (NTD) yield of adjoining farmer-cooperators

3. Department of Agriculture – Regional Field Units

- Take the lead in the implementation of the *Tipid-Abono* Fertilization Program in the region in consultation with BSWM
- Coordinate among local agencies involved in the project;
- Facilitate the conduct of trainings related to the project;
- Assist in the conduct of soil and water sampling and socio-economic survey, and other data gathering activities;
- Facilitate the promotion of techno-demo outputs
- Assist in site selection and conduct of techno-demo
- Provide assistance in the analysis of soil, water, and plant tissue samples through its Regional Soil Laboratory.

4. Philippine Rice Research Institute (PHILRICE)

- Provide technical briefings for the TAFP particularly on the Leaf Color Chart (LCC) and Minus One Element Technique (MOET) technology
- Provide LCC and MOET kits/materials necessary in the conduct and implementation of the TAFP
- Serve as co-partner in monitoring and evaluating demonstration sites
- Provide technical assistance necessary in the course of the TAFP implementation.

5. Local Government Unit

- Facilitate the promotion of the "*Tipid-Abono*" Fertilization technology; conduct of trainings related to the project; and assist in the soil and water sampling, socio-economic survey and other data gathering needs/activities
- Commit/provide Technicians as technical counterparts in the implementation of the project.

6. Land Bank of the Philippines

- Provide assistance to farmers in terms of loans for purchase of production inputs
- Provide assistance in technology promotion through briefings/ orientation

7. QUEDANCOR

- Provide assistance to farmers in terms of loans for purchase of

production inputs and other post-harvest facility requirements

8. National Agriculture and Fishery Council (NAFC)

- Provide financial support to various packages of organic-based production programs

9. Fertilizer and Pesticides Authority (FPA)

- Responsible for fertilizer registration, monitoring and regulation

Clustered Farmer-cooperators

Role of Farmer-cooperator in the clustered farm

- Provide the usual labor requirements from land preparation up to harvesting and the required pesticides needed to control insect pests, diseases, and weeds.
- Provide assistance to the members of the team in weekly LCC reading, monitoring, data gathering and conducting minus-one element technique.

B. SITE SELECTION WITHIN THE CLUSTER AREAS

- Site should be representative of the fertilizer groupings grown to irrigated rice.
- Clustered farms should be composed of 10-20 hectares adjacent to contiguous farm lots.
- Homogenous area and minimum of 0.5 hectare per farmer is required.
- Site should be accessible and easily visible to other farmers of adjoining barangays and researchers.
- Site should have more or less the same cropping system and management history.
- Site should be undisturbed by siltation, excavation and fillings and approximately 50 meters away from the shades, possible overflow from irrigation canal and other disturbances.

Table 7a. Data on agronomic parameters

PLT. NO.	Tiller Count			Biomass (g/hill)	Dry Matter Yield (g/hill)
	M.T.	P.I.	Harvest	Harvest	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Date Harvested: _____Maturity:_____
Data Collected by: _____Variety Used:_____
Date sown: _____
* Refer to productive tiller

Yield (kg) of 10 m x 10 m harvest area: _____
Moisture content (MC) at harvest (%): _____
Adjusted grain yield (kg/ha) at 14 % MC:

$$= \frac{\text{Yield (kg) of Harvest area}}{100 \text{ sq.m.}} \times \frac{10,000 \text{ sq.m.}}{\text{Ha}} \times \frac{100\text{-MC}}{86}$$

Where:
MC - moisture content of palay at harvest

Table 5. **Data on Water Analysis**

PROPERTIES	At Entrance*	Growth Stages	
		Mid - Tillering	Panicle Initiation
1. pH			
2. E.C.			
3. SO4			
4. P			
5. K			
6. NO3-N			
7. NH4-N			
8. Cu			
9. Zn			
10. Fe			
11. Mn			

* Benchmark data taken before establishment of techno-demo at the entrance of irrigation canal

Table 6. **Data on plant analysis**

Growth Stages	N (%)	P (%)	K (%)	Zn (%)
Mid Tillering				
Panicle Initiation				
Harvest				

C. CLUSTER OF FARMER-COOPERATOR SELECTION

- Should include the best farmers in the locality who have consistently shown high yields; possess leadership and ability to influence and share his knowledge to other farmers.
- Should show interest and recognize the importance of the techno- demo trial.
- Should be willing to follow the requirements of the techno-demo, provide free labor and the use of a portion of his field for the duration of the techno-demo, and be a good innovator and accepts newly introduced technology.

D. VARIETAL SELECTION

- Varieties to be used should depend on the adaptability to site and prevailing cropping season (hybrid or certified inbred seeds).

  Choose only one variety within the techno-demo site for uniformity in maturity, crop stand and easy interpretation of yield results.

- Choose the right high yielding variety with good eating quality and of desired maturity; resistant or tolerant to major pests, diseases and salinity problem soils.

E. PROCEDURE

1. Pre-techno-demo activities

   - Coordination with DA-LGU, DA-RFU, Philrice, LBP, and Quedancor.
   - Briefing of farmer-cooperators together with other agencies involved.
   - Collect composite soil samples at a depth of 30 cm for each farmer-cooperator farm before land preparation.
   - Water samples should be taken from the irrigation canal entrance of farms that compose a cluster and submit to the

Note: *Determine the soil fertility level using STK analysis within the clustered farms. Based on the dominant fertility level, decide where to put up 10m x 10m harvest area for monitoring and data gathering purposes; submit the soil samples of that farm where harvest area is located for complete laboratory analysis as benchmark data indicated in Table 3.*

laboratory for water analysis as benchmark data indicated in Table 5.

- Where available, conduct Minus One Element Technique (MOET) based on enclosed procedure.

Note: *Result of the MOET, however, serve as one of the basis for further reformulation of fertilizer recommendation for the next cropping season by fertilizer groupings in extreme cases where other nutritional disorders still occur as yield limiting factor. Minus One Element Technique (MOET) is a technology that determines the nutrient deficiencies in irrigated lowland rice. It shows the status of essential nutrients in the soil such as N, P, K, Zn, S, and Cu. This method simulates actual field condition (i.e. flooded or submerged condition), is farmer friendly, and does not require sophisticated equipment.*

2. Establishment and Management of Techno-demo sites

♦ **Land Preparation**

- Start preparing the field 3 weeks before seeding or transplanting. Fix all dikes, soak the field for at least 1 day to soften the soil, then plow to a depth of at least 10-15 cm to incorporate weeds and rice stubbles to hasten decomposition. Irrigate the field after plowing to prevent nitrogen loss from the soil

- Puddle the soil by harrowing 3-5 days after plowing. Begin second harrowing 5-7 days. Keep the field flooded.

- Harrowing and final leveling should be finished a day before the scheduled transplanting. Level the field thoroughly to ensure uniform water depth in the field.

> **For Heterogeneous Plots**
(High and low areas with non-uniform crop growth)

If the area is heterogeneous, that is, there are low or elevated areas or different soil nitrogen status, divide the area into several plots of similar characteristics. Then get LCC readings of 10 representative plants from each plot. For each plot, *if there are five or more leaves with LCC readings below 4, apply 30 kg N/ha. This is equivalent to 1 1/3 bags of urea or 3 bags of ammonium sulfate.*

Source: PhilRice

NOTE:
For Rapid Soil Testing (RST) and Soil Test Kit (STK), refer to brochures or manual

Table 3. SOIL DATA

Soil Properties	Initial	At Harvest
1. pH		
2. Organic Matter (%)		
3. Nitrogen		
4. Phosphorus		
5. Potassium		
6. Sulfate		
7. Calcium		
8. Magnesium		
9 Zinc		
8. Texture		

Table 4. Soil data taken at phenological stages

Phenological Stages	Use STK				Use RST		
	pH	N	P	K	Zn	Ca	Mg
Mid Tillering (M.T.) *							
Panicle Initiation (P.I.) **							

* M.T. = 38-40 DAS or 18-20 DAT (for 110 - 115 days early maturing variety)
= 41-45 DAS or 21-25 DAT (for 116 - 125 days medium maturing variety)

** P.I. = 45-50 DAS or 25-30 DAT (for 110 - 115 days early maturing variety)

Note: DAS includes 20 day old seedlings in the seedbed using wetbed method. In dapog method, however, it is safer to use DAT instead of the computed DAS in determining mid-tillering stage (M.T.). P.I. is computed by subtracting 65 days from maturity of variety.

Starting on the 14th day after planting, observe the growth of the rice plants.

Step 5 - After 45 days, compare the growth of the plants in each pot with that of the plants in complete treatment (N, P, K, Zn, S, and Zn) that must be healthy. If the growth of the plants in all pots is as healthy as that of the plants in the complete treatment, then the soil has sufficient nutrients.

Step 6 - Compare the biomass for each treatment with that of the complete treatment. If the biomass (dry weight of the whole plant, excluding the roots) of a treatment is less than 80% of that from the complete treatment, the nutrient represented in the label of the pot is deficient.

_____

Source: PhilRice

How to use the Leaf Color Chart (LCC)

- Compare the color of the topmost fully expanded and healthy leaf of a representative rice plant with the LCC.

- The LCC comes with six color gradients, starting with yellowish green (1) representing the lowest N concentration, and dark green (6) or highest N concentration. The critical value set for irrigated lowland rice variety is 4. Apply 30 kg N/hectare (1 1/3 bags urea or 3 bags ammonium sulfate) if majority of the leaves in a sample have LCC reading below 4 . No need to apply fertilizer if majority of the leaves in the samples have LCC reading above 4.

- Take readings between 8-10 am when there is no much glare from the sun. Avoid taking readings very early in the morning since dew drops can make reading difficult.

> **<u>For Homogenous Plots</u>**
> *(Fairly level area with uniform crop growth)*

Measure the topmost fully expanded healthy leaves of ten plants from a plot or hectare if the area is homogenous. *If five or more of the leaves have LCC readings below 4, apply 30 kg N / ha. This is equivalent to 1 1/3 bags of urea or 3 bags of Ammonium Sulfate.*

Note: *Uniform water depth helps suppress growth of weeds and maximize fertilizer efficiency. It also avoid portions of the field with high water depth that may reduce number of tillers and prone to possible damage of snails during early vegetative stage.*

♦ **Seedbed Preparation and Raising Healthy Seedlings (Wetbed method)**

- While the seeds are being soaked, prepare the land and make a 400m^2 seedbed at 2m x 20m plot size (10 plots) or any convenient length and width such as 1m x 20m (20 plots) or 2m x 5m (40 plots).
- Apply any organic materials for every 400 m^2 in the seedbed in order to make the soil loose to facilitate pulling of seedlings and minimize root damage.
- Use 20 kg new hybrid seeds per hectare or 40 kg of inbred seeds (seeding rate)
- Soak the hybrid seeds in clean water within 12-24 hours and not less than 24 hours for inbred seeds
- Incubate the hybrid seeds within 12-36 hours and 24-36 hours for inbred seeds.
- Sow the incubated seeds on the seedbed at a rate of 50g/m^2 (hybrid) and 100g/m^2 (inbred)
- Control weeds immediately (through hand weeding) and protect seeds and seedlings from rats (through rat bait) and golden snail (hand picking). Weed growth is expected in sparsely sown seeds.
- If nutrient deficiency is observed like yellowing of seedling leaves, apply ammonium phosphate (16-20-0) or complete (14 -14-14) fertilizer at the rate of 5-10 g/m^2 ten (10) days after seeding whichever is available and cheaper.
- Water the seedbed 2-3 days after sowing (DAS) or when the soil begins to crack. Maintain 2-3 cm water depth to avoid producing tall and weak seedlings in the seedbed.

♦ **Transplant Seedlings and Replant Missing Hills**

- Transplant 20-25 day-old seedlings (hybrid) at 1-2 seedlings/ hill and 2-3 seedlings for inbred
- Planting distance is 20 cm x 15 cm during dry season and 20 cm x 20 cm during wet season.
- Replant missing hills not later than 3-5 days after transplanting to avoid uneven maturity of the crop.

(*Dapog* Method)

- Use 1 kg seeds /1.5m^2 or 40 kg of seeds/60m^2; water 4-5 times a day or as often as needed. Press seeds (then the young seedling) with board to flatten the roots and avoid seedlings to grow on top of each other.

♦ **Water Management After Transplanting and at Harvest**

- Irrigate for 1-3 days after transplanting. Maintain 2-3 cm water depth for wetbed seedlings, and 1 cm for dapog seedlings 2 days after transplanting.
- During the early vegetative stage, maintain 3-5 cm depth of water. From maximum tillering stage up to flowering , maintain 5 cm water depth.
- Drain water 2 weeks before harvest during wet season. Gradually drain to saturation point during dry season. Avoid drying-up of the soils as this will affect grain quality.

♦ **Pest and Disease Management**

- *Insect*. Practice synchronous planting - plant within a month of the regular planting time in the community. Regularly monitor the crop at various growth stages to check the presence of insect pests and diseases. Apply control measures whenever necessary.
- *Golden Snail*. Herd ducks in the field after harvest; handpick snails and their eggs; control water; put screen wires along water outlets and inlets or use recommended molluscides.
- *Weeds*. Apply pre-emergence herbicides 2-5 days after transplanting. Hand weed, if needed or use rotary weeder for straight row system of transplanting.
- *Rats*. A community effort is needed to destroy all breeding sites of rats before cropping season starts.

(**Direct Seeding)**

- Direct seeding reduces labor costs because it does away with seedbed preparation, seedbed care, pulling of seedlings, and transplanting which could mean substantial savings for the farmer.

How to use Minus One Element Technique (MOET)

- Materials (7 plastics pots or any suitable container); 28 kgs soil to be tested, preferably wet; pre-weighed fertilizer formulation (available at PhilRice Los Baños); at least 28-35 rice seedlings (10-15 days old) or pre-germinated seeds.

Step 1 - Mix the soil sample thoroughly. Put 4 kg of soil per pot. If the organic matter in the soil is still actively decomposing, keep the soil in the pot flooded for at least 2 weeks before transplanting or sowing.

- *Collect your soil sample before land preparation to make sure that your sample is not affected by fertilizer application. Collect the soil randomly at a depth of 20 cm. If the whole field has different fertility status as evidenced by crop stand, divide the field into uniform sampling units and test each sampling unit separately. Don't get your sample from abnormal location such as Carabao ponds or near piles of decomposing matter because these give erroneous results.*

Step 2 - Before transplanting or sowing, mix the fertilizer formulation thoroughly with the soil in each pot. Label the pots: complete, -N, -P, -K, -Zn, -S and –Cu.

- *After mixing each fertilizer formulation with soil samples in its pot, make sure to wash your hands with water to avoid contamination. Cigarette butts, dash, and other contaminants should also be avoided. Proper handling of fertilizer formulation packets is important.*

Step 3 - Transplant 4-5 seedlings per container. When using pre-germinated seeds, it is best to sow more seeds per pot to avoid replanting

- *Keep the soil wet but without standing water until the seedlings have fully recovered from transplanting shock. Once water is introduced, see to it that the pots have standing water. It is more practical to use tap or irrigation water. Retain only the 2 best growing plants per pot 7 days after transplanting or 7-10 days after sowing.*

Step 4 - Grow the plants up to 45 days after transplanting or sowing.

Continuation: Table 2

Group 4 104 kg N 30 kg P205 7 kg K20	Basal application: 1 sack 18-46-0 1 sack 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 4 sacks AmmoSul 2 sacks Urea	10 kg. Zinc sulfate (for zinc deficient areas)	CARAGA: Agusan Sur and Norte, Surigao Sur CAR: Ifugao, Kalinga, Apayao Region 4: Cavite, Palawan, Romblon Region 9: Zamboanga del Norte
Group 5 104 kg N 30 kg P205 7 kg K20	Basal application: 1 sack 18-46-0 1 sack 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 4 sacks AmmoSul 2 sacks Urea	20 kg Zinc Sulfate (for zinc deficient areas)	CAR: Tabuk, Kalinga Region 1: San Manuel and Urdaneta, Pangasinan Region 2: Villaverde, Solano and Bagabag, Nueva Vizcaya Region 3: Camiling,Tarlac; Arayat and Magalang, Pampanga; San Ildefonso, Bulacan; Her mosa, Bataan; Gapan, Nueva Ecija Region 4: Sta. Cruz, Laguna Region 6: Banga, Aklan; Sibalom, Antique, Barotac, Nuevo Cabatuan and Pototan, Iloilo Region 8: Palo, Leyte; Basey, Samar Region 9: Polanco, Zamb. del Norte; Tukuran, Zamb. del Sur; Zamb. Sibugay Region 10: Gingoog City Caraga: Butuan City, Agusan Norte; Pros peridad, Agusan Sur ARMM: Sinsuat, Maguindanao
Group 6 94 kg N 30 kg P205 12 kg K20	Basal application: 1 sack 18-46-0 1 sack 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 3 sacks AmmoSul 2 sacks Urea	10 kg. Zinc Sulfate	Region 1: Curimao, Ilocos Norte; Sta. Catalina and Sta. Maria, Ilocos Sur; Binmaley, Lingayen, and Sual, Pangasinan Region 2*: Appari; Boguey; Cama, Lanuigan, Ballesteros, Sanches Mira, Claveria, Santa, Pamplona, Sta.Teresita, Cagayan Region 3: Sesmoan, Macabebe and Masantol, Pampanga Region 5*: Calabanga, Canaman, Bonbon, Magarao, Libmanan, Cabusao, Pamplona, Gainza, Camaligan, Camarines Sur. Caraga*: Nasipit, Cabadbaran, Magallanes, RTR, Carmen (saline areas)

** for verification*

- Direct seeding results in a shorter duration of maturity. Generally, a direct seeded crop matures 7-10 days earlier than a transplanted crop because seedlings are not pulled. Pulling usually causes root injuries requiring a period recovery which prolongs the crop's duration of maturity.
- After a 36-48 hour incubation (radical breaks seed coat), open the sacks to cool off the seeds before broadcasting. Use a rate of 80-100 kg per hectare.
- Prepare the field thoroughly so the crop has an initial headstart over weeds. Take note that weeds are more competitive in direct seeding since they grow almost simultaneously with the crop. Level the soil by planking.
- Do not broadcast seeds immediately after the last harrowing/ levelling. Allow the mud to settle for 12-24 hours before broadcasting the seeds.
- Broadcast seeds on a saturated field, but do not allow any standing water. Irrigate the field three days after broadcasting to re-saturate the soil. Herbicides may be applied for more effective weed control 3-6 days after broadcasting
- When necessary, handweed 20-25 days after broadcast to eliminate weeds which survive herbicide treatments.

♦ **Integrated Nutrient Management**

- Follow the tabulated "*Tipid-Abono*" Recommendation for rice according to Fertilizer Groupings indicated (Table 1).
- Apply the recommended commercial organic fertilizer three (3) days before transplanting to allow decomposition.
- Apply the recommended inorganic (N, P, K and Zn) fertilizers 14 DAT (days after transplanting). When applying fertilizer , reduce water level to almost field saturation (3cm) just enough to dissolve the fertilizer. Do not, however, dry the field.(i.e. soil surface showing cracks)
- Take the Leaf Color Chart (LCC) reading at weekly interval after 14 DAT or 21 DAS to determine the succeeding amount and right time of N application up to the initial flowering.
- After first fertilizer application at 14 DAT, apply succeeding nitrogen requirement if nitrogen deficiency occurs based on LCC readings specially during the critical period at maximum tillering stage and one week before flowering.

Note: *Maximum tillering stage of transplanted 20 day old seedling is estimated at 40-45 DAS (20-25 DAT) for early maturing varieties and 46-55 DAS (26-35 DAT) for medium maturing varieties. This is estimated by subtracting 70 days from the maturity of variety.*

One week before flowering of transplanted 20 day old seedling during dry season is estimated at 61-66 DAS (41-46 DAT) for early maturing varieties (110-115 days) and 67-76 DAS (47–56 DAT) for medium maturing varieties (116-125 days). This is estimated by subtracting 45 days from the maturity of variety during wet season and 49 days during dry season.

- In Fertilizer Group 4 and 5 (Table 1), apply second fertilizer dosage using 1 bag of ammonium sulfate in combination with 1 bag of urea if there are five or more leaves from 10 representative random hill which shows LCC readings below 4 during or before maximum tillering stage or 1 week before panicle initiation. Based on LCC readings, apply third fertilizer dosage using 1-2 bags of urea on or one week before flowering.
- In other fertilizer groups 1-3 & 6 (Table 1), apply second fertilizer dosage using 1-1.5 bags of urea if there are five or more leaves from 10 representative random hills with LCC readings below 4 on or before maximum tillering stage or 1 week before panicle initiation. Based on LCC readings, apply third fertilizer dosage using 1-1.5 bags of urea on or one week before flowering.

Note: *Table 2 presents the recommended Fertilization where organic fertilizer is not available.*

♦ Data Gathering, sampling and monitoring

- Take LCC reading starting from 14 DAT up to initial flowering (Refer to Table 8)
- Identify and establish specific sampling area for soil, water and plant sample collection. Mark 10m X 10m as harvest area (crop cut area) for yield measurement per farmer cooperator (Fig. 1)
- Dig out three hills of plant samples from designated three different places illustrated in figure 1 and also take composite soil samples from uprooted hills at mid-tillering and panicle initiation (refer to Table 4).
- Collect about 500 ml of composite water samples at mid-

Table 2. Recommended Fertilization where Organic Fertilizer is not available

Recommended Fertilizer Grouping (kg/ ha)	Recommended Fertilizer Grade Combination	Additional Zinc sulfate/ ha.	Regions
Group 1 100 kg N 37 Kg P205 14 kg K20	Basal application 1 sack 18-46-0 2 sacks 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 3 sacks 21-0-0 2 sacks Urea	15 kg. Zinc sulfate for sulfur deficient areas)	Region I: Ilocos Sur, Ilocos Norte, La Union, Pangasinan Region 2: Isabela Region 3: Tarlac Region 5: Albay
Group 2 102 kg N 53 kg P205 7 kg. K20	Basal application: 2 sacks 18-46-0 1 sack 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 3 sacks AmmoSul 2 sacks Urea	10 kg. Zinc sulfate	Region 2: Quirino, Nueva Vizcaya, Cagayan Region 3: Nueva Ecija, Bulacan, Bataan, Zambales, Pampanga, Aurora Region 4: Laguna, Quezon, Mindoro Occ Region 5: Catanaduanes, Cam. Sur, Cam. Norte, Masbate, Sorsogon Region 6: Aklan, Antique, Capiz, Iloilo, Negros Occ. Region 7: Bohol, Negros Oriental Region 8: Leyte, Samar Region 10: Misamis Oriental, Mis. Occ., Bukidnon Region 11: Davao del Sur, Davao Oriental, Davao Norte, ComVal, South Cotabato Region 12: Lanao del Norte, North Cotabato, Sultan Kudarat CAR: Abra
		20 kg. zinc sulfate	Region 4: Mindoro Oriental
Group 3 100 kg N 37 kg P205 14 kg K20	Basal application: 1 sack 18-46-0 2 sacks 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 3 sacks AmmoSul 2 sacks Urea	10 kg. Zinc sulfate (zinc deficient areas)	ARMM: Maguindanao, Lanao del Sur Region 4: Marinduque Region 9: Zamboanga del Norte CARAGA: Surigao del Norte

Continuation: Table 1

Group 4 72/95 kg. N 28 kg. P205 5 kg. K20	Basal application 5 sacks of organic fertilizer 1 sack 18-46-0 Broadcast application based on Leaf Color Chart (LCC): 2-3 sacks Urea 1 sack AmmoSul	10 kg. Zinc sulfate	CARAGA: Agusan Sur and Norte, Surigao Sur CAR: Ifugao, Kalinga, Apayao Region 4: Cavite, Palawan, Romblon Region 9: Zamboanga del Sur
Group 5 72/95 kg. N 28 kg. P205 5 kg. K20	Basal application: 5 sacks of organic fertilizer 1 sack 18-46-0 Broadcast application based on Leaf Color Chart (LCC): 1 sack AmmoSul 2 - 3 sacks Urea	20 kg Zinc Sulfate (for zinc deficient areas)	CAR: Tabuk, Kalinga Region 1: San Manuel, and Urdaneta, Pangasinan Region 2: Villaverde, Solano and Bagabag, Nueva Vizcaya Region 3: Camiling, Tarlac; Arayat and Magalang, Pampanga, San Ildefonso, Bulacan; Hermosa, Bataan; Gapan, Nueva Ecija Region 4: Sta. Cruz, Laguna Region 6: Banga, Aklan; Sibalom, Antique; Barotac, Nuevo, Cabatuan and Pototan, Iloilo Region 8: Palo, Leyte; Basey, Samar Region 9: Polanco, Zamboanga del Norte; Tukuran, Zambo. Del Sur; Zambo. Sibugay Region 10: Gingoog City Caraga: Butuan City; Agusan Norte; Prosperidad, Agusan Sur ARMM: Sinsuat, Maguindanao
Group 6 68/91 kg. N 35 kg P205 12 kg. K20	Basal application 5 sacks of organic fertilizer 1 sack 14-14-14 1 sack 18-46-0 Broadcast application based on Leaf Color Chart (LCC): 2-3 sacks Urea	10 kg. zinc sulfate	Region 1: Curimao, Ilocos Norte, Sta. Catalina, Sta. Maria, Ilocos Sur, Binmaley, Lingayen, Sual, Pangasinan Region 2: Aparri; Boguey; Camalaniugan; Ballesteros; Sanches Mira; Claveria; Santa; Pamplona; Sta. Teresita, Cagayan Region 3: Sesmoan, Macabebe, Masantol, Pampanga Region 5: Calabanga; Canaman; Bonbon; Magarao; Libmanan; Cabusao; Pamplona; Gainza; Camaligan, Camarines Sur Caraga: Nasipit; Cabadbaran; Magallanes; RTR; Carmen (saline areas)

Note: *Soil samples collected at mid-tillering and panicle initiation will be analyzed using STK and RST to determine the chemical properties of soil samples (Refer to Table 4 and 6). Only soil samples collected before land preparation and at harvest will be submitted to the laboratory for the required soil texture and chemical analysis (refer to Table 3). Soil samples must be labeled accordingly and air dried.*

Plant samples should be placed in a properly labeled plastic bags prior to washing and transferred to paper bags. Air-dry properly the labeled plant samples and submit to BSWM or Regional Soils laboratory for further sample preparation and analysis. If oven is available at Regional Soils laboratory, temperature should not be greater than 70^{0}C.

tillering and panicle initiation stages for water analysis to determine nutrient present within rice paddy and water quality (refer to Table 5).

Note: *Place bottled water samples in ice-filled box and submit to laboratory within a day after collection in the field or refrigerate the samples in the laboratory. If possible take water samples at 2:00 p.m. when microbial/chemical reaction is at its peak. Add 3 drops of phenyl mercuric acetate (PMA) to arrest microbial activity.*

- Count the number of tillers in 16 randomly chosen hills within the sampling area at mid-tillering, panicle initiation stages and at harvest (Refer to Table 7a)
- Cut the 16 hills at ground level and get the number of panicles per hill. Weigh the rice straw per hill at harvest and take dry matter weight per hill.
- Take grain yield from a designated 100m^2 harvest area (10m x 10m) and actual yield of each farmer-cooperator. Take moisture content (MC) reading after weighing grain at harvest. Adjust grain yield and actual yield to 14% moisture content.

Note: *Take about 100 grams of palay after threshing and place in a plastic bag for MC determination. Palay samples can be immediately submitted to the National Seed Quality and Control Services (NSQCS) office of the Bureau of Plant Industry within the respective Regions to determine actual M.C. for accurate grain yield adjustment. A newly harvested palay have a high moisture content of 20-26 percent. An NSQCS personnel can also be invited during harvest festival for MC determination.*

- Record the actual yield of each farmer-cooperator and adjust average grain yield of techno-demo to 14% MC (refer to Table 7b.

- Economic information such as area planted, yield, farming practices, production costs and income within the cropping period under study should be gathered from the farmer-cooperators of techno-demo farms (TD), and at least three (3) non techno-demo farms (NTD) or farms adjacent to the TD to compare the TD and NTD within the same cropping season. Additionally, same information would be gathered only from the farmer-cooperators before the implementation of *Tipid Abono* Fertilization Program (TAFP).
- Refer to Table 3 to 9 for the prescribed presentation format of laboratory analysis results and information on economics.

♦ Harvesting

- Harvest palay when 80-85% of the grains are matured.
- Thresh immediately to minimize field losses and deterioration of grain quality.

♦ Field Day/Harvest Festival

- Ceremonial harvesting
- Presentation of techno-demo harvest results (yield per hectare, yield increment)
- Testimonials of success stories

Table 1. Recommended Balanced "Tipid-Abono" Fertilization by Specific Province

Recommended Fertilizer* Grouping (kg/ha)	Recommended Fertilizer Grade Combination	Additional Zinc sulfate/ ha.	Regions
Group 1 68/91 N 35 kg P205 12 kg K20	Basal application 5 sacks of organic fertilizer 1 sack of 18-46-0 1 sack of 14-14-14 Broadcast application based on Leaf Color Chart (LCC): 2-3 sacks Urea Ammosul	15 kg. Zinc sulfate	Region I: Ilocos Sur, Ilocos Norte, La Union, Pangasinan Reg.3: Tarlac Region 2: Isabela Region 5: Albay
Group 2 69/92 kg. N 38 kg. P205 5 kg. K20	Basal application 5 sacks of organic fertilizer 1 sack of 18-46-0 1 sack of 16-20-0 Broadcast application based on Leaf Color Chart (LCC): 2-3 sacks Urea	10 kg. zinc sulfate	CAR: Abra Region 2: Quirino, Nueva Vizcaya, Cagayan Region 3: Nueva Ecija, Bulacan, Bataan, Zambales, Pampanga, Aurora Region 4: Laguna, Quezon, Mindoro Occidental Region 5: Catanaduanes, Cam. Sur, Cam. Norte, Masbate, Sorsogon Region 6: Aklan, Antique, Capiz, Iloilo, Negros Occ. Region 7: Bohol, Negros Oriental Region 8: Leyte, Samar Region 10: Misamis Oriental, Mis. Occ., Bukidnon Region 11: Davao Oriental, Davao del Norte, ComVal, South Cotabato Region 12: Lanao del Norte, North Cotabato, Sultan Kudarat
		20 kg. zinc sulfate	Region 4: Mindoro Oriental
Group 3 67/90 kg. N 22 kg P205 12 kg. K20	Basal application 5 sacks of organic fertilizer 1 sack 14-14-14 1 sack 16-20-0 Broadcast application based on Leaf Color Chart (LCC): 2-3 sacks Urea	10 kg. Zinc sulfate	ARMM: Maguindanao, Lanao del Sur Region 4: Marinduque Region 9: Zamboanga del Norte, CARAGA: Surigao del Norte

* Recommended rates include nutrients from organic fertilizer based on the following analysis:

2.5% N; 2.0% P_2O_5; 2.0% K_2O