The MUNGBEAN Plant

Description of Plant

Mungbean (*Vignaradiata*(L.) Wilczek) is one of the most important legume crops in South and Southeast Asia. It is in the Legume family of plants and is closely related to adzuki and cowpea (in the same genus but different species). It is a warm season annual, highly branched having trifoliate leaves like the other legumes. The plant is upright and vine types of growth habit occur in it, with plants varying from one to five feet in length. Root system consisting of a well-developed taproot with deeply placed lateral roots; stem much branched, with a tendency to twine at the tips, angular, covered with long spreading hairs. Leaves alternate, 3-foliolate (sometimes 5-foliolate), dark green; stipules 5–18 mm × 3–10 mm, peltate, ovate, rhomboid or obovate-oblong; petiole 5–21 cm long, rachis 1.5–4.5 cm long; stipels conspicuous, 5–10 mm long; petiolules 3–6 mm long; leaflets entire or 2–3-lobed, 5–18 cm × 3–15 cm, elliptical, rhomboid or ovate, base broadly cuneate or rounded, apex acuminate, glabrous or hairy on both surfaces, distinctly 3-veined from the base, the lateral leaflets unequal-sided.

The pale yellow flowers are borne in clusters of 12–15 near the top of the plant. Mature pods are variable in color (yellowish-brown to black), about five inches long, and contain 10 to 15 seeds. Self-pollination occurs so insect and wind are not required. Seeds are 2.5–4 mm × 2.5–3 mm × 2.5–3 mm, globose to ellipsoid or cube-like. Mature seed colors can be yellow, brown, mottled black or green, depending upon variety. These round to oblong seeds vary in size from 6,000 to over 12,000 per pound, depending upon variety. Germination is epigeal with the cotyledons and stem emerging from the seedbed.

Mungbean resembles black gram (Vignamungo (L.)) with two main differences: the corolla of Vignamungo is bright yellow while that of Vignaradiata is pale yellow; mungbean pods are pendulous whereas they are erect in black gram. It is also slightly less hairy than black gram.

The more common vernacular names include: mungbean, green gram, golden gram (English), balatung (Tagalog), dau-xanh (Vietnamese), Nongtaao or puasha (Hmong), moy-ashimame (Japanese), Iutou (Mandarin Chinese), look dou (Cantonese Chinese), Haricot mungo, mungo, ambérique, haricot doré (Fr.), Feijãomungoverde (Po.), Mchooko, mchoroko (Sw).

Origin and major types

The plant has been grown in India since ancient times. It is still widely grown in Southeast Asia, Africa, South America and Australia. It was apparently grown in the United States as early as 1835 as the Chickasaw pea. There are 3 subgroups of Vignaradiata: one is cultivated (Vignaradiata subsp. radiata) and two are wild (Vignaradiata subsp. sublobata and Vignaradiata subsp. glabra).

Production Trends

Mungbean is native to the Indo-Burma region with India, Burma, Thailand and Indonesia producing almost 90 per cent of the world's production.

In the Philippines, data from the Bureau of Agricultural Statistics show that the highest volume of production for the past five years in the Philippines was achieved in 2011, with 45,283 metric tons from the total production area of 32, 960 hectares. In 2012, area planted to mungbean was 44, 324 hectares and total volume of production was 32,364 metric tons with the province ofIsabela as the top mungbean producer contributing 26% to the country's production. However, national average yield per hectare remains quite low at 0.73 metric ton.

The Philippines imported 30,736 mt of dried mungbean worth US$5.4M in 2006; up by 0.13% in tonnage and by 11.7% in value than in 2005. In 2006, the country exported 20 mt of dried mungbean worth US$27,553; down by 86% in tonnage and by 45% in export earnings compared to 2005.

San Mateo, Isabela is the biggest producer of mungbeans in the Philippines with a production of 800 to 1,000 kilos/ha at the prevailing price of P32 per kilo. This translates to incomes ranging from P25, 600 to P32, 000 per hectare. This means a P224-million additional income for local farmers during summer. The town has more than 7,000 hectares of farms planted to mungbeans during the dry season and it is now declared as the "Mungbean Capital of the Philippines."

Nutritional Values

As a food source mungbeans have some valuable properties. Products which need high consistency under high temperature benefit from the heat stable viscosity of mungbean starch.

Mungbean is rich in easily digestible protein (24%). It adds much-needed diversity to the cereal-based diets of the poor. The protein is easily digested and is of a high quality, making it based food preparations especially good for children, elderly people and invalids.

It also contains vitamin A (94 mg), iron (7.3 mg), calcium (124 mg), zinc (3 mg) and folate (549 mg) per 100 grams dry seeds.Mungbeans are also high in vitamins B1, B2 and C and niacin.

In the diet it should be noted that mungbeans are not a perfect protein source and should be consumed with other sources of protein which have high percentages of sulphur-containing amino acids, such as cereals, rice and sesame.

Uses (Culinary)

It is used as a raw material in mungbean sprout production, sotanghon manufacturing, hopia making, and in dishes such as soups, porridge, bread, noodles and ice cream. Its agronomic characteristics permit it to fit in various cropping systems as an intercrop, rotation, and relay crop. In addition, its crop residues can be used as fodder.

Varieties

Recommended local mungbean varieties can be sourced from the Bureau of Plant Industry (BPI) and its National Crop Research and Development Centers particularly at La Granja in Bacolod and Los Banos in Laguna; Institute of Plant Breeding-University of the Philippines at Los Banos (IPB-UPLB); Department of Agriculture-Regional Integrated Agricultural Research Centers (DA-RIARCs); and from accredited private seed growers.

For your guide, please refer to the list of National Seed Industry Council (NSIC) approved mungbean varieties.

List of NSIC Approved Varieties

Varieties	Yield (t/ha)	Maturity	Remarks
Pag-asa 1	1.04-1.31	57-59 days after emergence (DAE)	Released by the Phil. Seed Board (PSB) in 1977. Has shiny green seeds; fairly resistant to *Cercospora* Leaf Spot and Powdery Mildew; pods are ex-posed above the leaf canopy allowing more effective pest control measures and faster harvesting; second flush of flowers after priming is completed and contributes to about 25% of the total harvest.
Pag-asa 3	1.10-1.57	63-73 DAE	Released in 1983; has shiny yellow seeds.
Pag-asa 5	1.10-1.46	60–76 DAE	Released in 1986; has shiny green seeds and is tolerant to water logging.
Pag-asa 7	1.00-1.70	62–74 DAE	Released in 1989; has shiny green seeds; resistant to *Cercospora* Leaf Spot; performs well in partially shaded areas (under coconut); tolerant to drought; suitable for sprout production as well as starch source for the manufacture of noodles ("sotanghon")
 Pag-asa 11 (PSB Mg 5)	1.12-1.20	60-61 DAE	Released in 1999; has glossy green seeds, slender pods which are almost parallel to the ground; moderately resistant to *Cercospora* Leaf Spot. Thrives in acid soil; drought tolerant and a good N-fixer.
 Pag-asa 13 (NSIC Mg 8)	0.88-2.66	66 DAE	Has yield advantage of 13% over Pagasa 3; yield comparable to Pagasa 7; has glossy green seeds and is recommended for post-rice crop-ping in Region 1 and pre- & post-rice croppings in Region 2.

 Pag-asa 15 (NSIC Mg 9)	1.07-1.18	57–58 DAE	Recommended for both wet and dry season planting; out-yields PSB Mg2 by 6% and PSB Mg4 by 23% in wet season and 10% in dry season; moderately re-sistant to *Cercospora* Leaf Spot; has comparable yield with drought tolerant Pagasa 7. Under limited water conditions, fixes 69.9% kg/ha N under post-rice conditions; has glossy green & medium-sized seeds; and weighs 5.1 g/100 seeds.

 Pag-asa 17 (NSIC Mg 10)	1.07-1.15	57-88 DAE	Has glossy green & medium-sized seeds; weighs 5.3 g/100 seeds and moderately resistant to *Cercospora* Leaf Spot; yield advantage over PSB Mg2 and PSB Mg4 at 20% in wet season and 9% in dry season; and has the ability to fix 88.14 kg/ha N.
MG 50-10A ("Wonder")	1.00-1.30	60–65 DAE	Released in 1969; has glossy green seeds; weighs 6.7 g/100 seeds; susceptible to *Cercos-pora* Leaf Spot and Powdery Mildew; responsive to high plant density; seeds contain 46.7% carbohydrates, 22.2% protein, and 1.4% fat.
MD 15-2 ("Super")	1.00-1.30	60-65 DAE	Released in 1969; has glossy green seeds; weighs 6.8 g/100 seeds; susceptible to *Cercos-pora* Leaf Spot and Powdery Mildew but non-shattering.
BPI Glab #3 ("Miracle")	1.00-1.30	60-65 DAE	Released in 1971; has glossy green seeds; weighs 6.8 g/100 seeds; susceptible to *Cercos-pora*Leaf Spot and Powdery Mildew; has hairless pods and seeds contain 58-63% carbo-hydrates and 24-26% protein.
BPI Mg 2 ("VC 1163")	1.10-1.40	56-57 DAE	Released in 1984; has glossy green seeds; weighs 6.1 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot and Powdery Mildew. It is non-lodging; seeds contain 21.4% protein and 63% carbohy-drates.

BPI Mg 5 ("VC2764")	1.10-1.4	62 DAE	Released in 1986; has glossy green seeds; weighs 6.1 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot and Powdery Mildew; non-lodging; seeds contain 23.3% protein and 61.1% carbohydrates.
BPI Mg 7 ("VC 1973")	1.20-1.50	62 DAE	Released in 1988; has glossy green seeds; weighs 6.6 g/100 seeds; moderately resistant to Powdery Mildew; resistant to *Cercospora* Leaf Spot and rust. It is non-shattering; and seeds contain 22.7% protein and 61.5% carbohydrates.
BPI Mg 9 ("VC 2768" or Taiwan Green")	1.03-1.14	62 DAE	Released in 1989; has glossy green seeds; weighs 5.8 to 6.1 g/100-seeds; moderately resistant to Powdery Mildew; resistant to *Cercospora* Leaf Spot, and rust; is non-lodging and non-shattering; seeds contain 23.6% protein and 62.6% carbohydrates.

BPI Mg 1 ("VC 3890" or Ellen C")	0.98-1.50	61 DAE	Released in 1995 and has glossy green seeds; weighs 6.2-6.3 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot, rust, and virus; seeds contain 24.87% protein and 59.12 carbohydrates.
 PSB Mg 2 ("VC 3876" or Mabunga")	1.15-1.30	61 DAE	Released in 1996; has dull green seeds; weighs 6.3-6.5 g/100 seeds; moderately resis-tant to *Cercospora* Leaf Spot, rust, virus & Powdery Mildew; seeds contain 23.08% protein and 68.02% carbohydrates.
 PSB Mg 3 ("VC 2764 Y" or "Ginintuan")	1.1-1.35	61 DAE	Released in 1996; has glossy yellow seeds; weighs 5.4 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot, rust, virus & Powdery Mildew; seeds contain 24.44% protein and 66.11% carbohydrates.

PSB Mg 6 ("VC 3995" or "Centennial Mungo")	1.0-1.16	60 DAE	Released in 1999; has glossy green seeds; weighs 5.6-6.3 g/ 100 seeds; moderately resistant to *Cercospora* Leaf Spot, rust and virus; seeds contain 24.57% protein and 60.51% carbohydrates.
PSB Mg 7 ("VC 3737A" or "Mabunga 2")	1.08-1.11	58 DAE	Released in 2000; has dull green seeds; weighs 5..3-6.2 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot, rust, and virus; seeds contain 24.54% protein and 62.61% carbohydrates.
 NSIC Mg 11 ("Kintab")	3.63	58 DAE	Released in 2001; has glossy green seeds; weighs 6.4 g/100 seeds; moderately resistant to *Cercospora* Leaf Spot, and rust; seeds contain 24.03% protein and 62.79% carbohydrates.
NSIC Mg 14	1.09-1.65	58 DAE	This variety has dull green seeds; moderately resistant to *Cercospora* Leaf Spot; seeds contain 23.76% crude protein, 65.98% carbohydrates, 43.5% starch, 4.2% ash, and 0.64% crude fat.
NSIC Mg 17	1.28-1.54	56-58 DAE	This variety has glossy green seeds; has 24.12% crude protein, 63.4%, carbohydrates and 3.78% ash.

Cultivation

Soil and Climatic Requirements

Mungbean is a dry season crop and can be grown best in rotation with rice or corn in an optimum temperature ranging from 20 to30^{o}C. It needs plenty of sunlight and a daylength of 11.5 to 13.0 hours.

In the Philippines, mungbean can be grown during the wet season (May-June); dry season (September-October); and late dry season (February-March). High humidity brought about by continuous rains could severely reduce the quality of harvested seeds. It can be profitably grown in different types of soil with pH ranging from 5.8 to 6.5.

It is fairly well adapted to sandy loam soils and a dry condition, which gives it a competitive advantage and permits it to fit in various cropping systems as an intercrop, rotation, and relay crop.

If grown during the wet season, the soil should be well-drained. Heavy soils are suitable only for dry season planting because mungbean is sensitive to extended periods of water-logging.

Just like other crops, mungbean production can be affected by several constraints such as erratic weather, insect pests and diseases, poor management practices, and the use of inferior or low yielding varieties or cultivars.

Cultural Management Practices

Land Preparation

Prepare the land thoroughly so that mungbean seeds can germinate uniformly, establish rapidly, and compete well with weeds. For the uplands, prepare the soil thoroughly by plowing alternated with harrowing at weekly interval. For post-rice culture, zero or minimum tillage can be practiced.

Planting

Drill the seeds along shallow furrows spaced 60 centimeters apart. Twenty (20) kgs of seeds is enough to plant a hectare. If seed inoculant is available, moisten the seeds with water, then mix the inoculant until all seeds are coated. Keep the newly inoculated seeds under shade until they are planted.

At planting, sufficient soil moisture is necessary so that the seeds can germinate uniformly. For post-rice culture, flood the paddy 1-2 days before planting. Then, drain the water before broadcasting the seeds.

Water Management

Mungbean is relatively tolerant to drought. However, it needs sufficientamount of water during its critical stages of growth and development (germination, vegetative, flowering and pod-filling stages).

The daily water requirement of mungbean differs, depending on intensity of solar radiation and rate of evaporation. In general, the crop requires 3.5 millimeters of water per day or about 410 millimeters per cropping season.

If there is residual rain and sufficient soil moisture, during the early dry season planting (September-October), supplemental irrigation is not needed. On the other hand, late dry season planting (January-March) requires irrigation at its various critical stages of development. Overhead sprinkler or furrow irrigation may be used to irrigate the field.

Nutrient Management

Mungbean obtains nitrogen through its symbiosis with the N-fixing bacteria in the roots. Excessive nitrates from applied fertilizer will restrict N fixation.

The amount of phosphorous (P) and potassium (K) removed by the crop (when it yields 2 tons per hectare) is the basis for deciding the amount of fertilizer to be applied to avoid depletion of these major elements. In P- and K-deficient soils, about 30-45 kgs per hectare each of these elements should be applied before planting.

In commercial production of mungbean, fertilization rate and type of application depends on the results of soil analysis. However, in the absence of such analysis and during dry season cropping, basal application of three bags (150 kgs of complete fertilizer (14-14-14) per hectare is recommended for heavy soils (loam to clay loam), and four bags (200 kgs) for light soils (sandy to sandy loam). You can also apply organic fertilizer if you want to produce mungbean organically as well as to improve the soil conditions.

It is recommended to inoculate the seeds with appropriate *Rhizobia* strain inoculant right before planting. Then apply only 20 kgs per hectare of nitrogen which can be supplied by 150 kgs of Triple14. Do not expose the newly inoculated mungbean seeds to direct sunlight. For upland planting, apply fertilizer evenly in furrows and evenly cover with a thin layer of fine soils before planting the seeds. With a machine applicator, the fertilizer is drilled 5 centimeters slightly below the side of the seeds at planting. This makes the fertilizer readily available to the roots of the growing young seedlings.

Crop Protection

A. Insect Pests

1. **Bean fly** (*Melanagromyzasojae*Zehntner) – the most destructive insect pest in early vegetative stage. It inserts its eggs into the cotyledonary leaves. The emerging larva tunnels from the leaves towards the stem and pupate within the stem just slightly above the soil surface, eventually causing wilting and stunting of the plants.
   Control Measures:
   a. Spray appropriate insecticide following the recommended dosage, 1-2 days after seedling emergence.
   b. Biological control is recommended such as the application of *Trichogrammachilonis* at the rate of 200 strips per hectare divided into weekly application starting seven days after emergence up to 40 days.
   c. Weekly spraying of naturally fermented solutions (NFS) is also recommended.

2. **Aphids** (*Aphis glycines*Matsumura) – can damage the young plants. It can also transmit deadly viruses.

Control Measures:

a. Spray appropriate insecticide directly to the aphid colonies.
b. Biological control is also recommended such as spraying of naturally-fermented solution, and Effective Microorganisms 5 (EM5).

3. **Pod borer** (*Etiellazinckenella*Treitschke) – lays its eggs on the petals or sepals. The larva feeds on the flower buds or immature seeds within the pods.

Control Measures:

a. Timely spraying of appropriate insecticide following the recommended dosage indicated on the label.
b. Biological control such as *Trichogrammachilonis*application, and weekly spraying of naturally fermented solution and vermitea for preventive measure. Likewise, application of assassin bug is also recommended at 1,000 bugs per hectare at the onset of flowering.

4. **Green Soldier Bug or stinkbugs** (*Nezaraviridula* L.)- observed unusually high populations of this pest (3-4 insects/meter row) uniformly over an entire field when pods are still green.

Control Measures:

a. Spray infested crop with appropriate insecticides following the recommended dosage.
b. Biological measures such as EM5, vermitea, and naturally fermented solutions (NFS) sprayed at weekly interval are recommended as preventive practice.

5. **Bruchids** (*Callosobruchusmaculatus*) - commonly called pulse beetles or cowpea weevils. It attacks mungbean both in field and storage but greater losses occur in the latter. The nutritional quality of the grains deteriorates because of the infestation rendering making them unmarketable.

Control Measures:

a. Maintain sanitation in the storage area by cleaning storage area properly,
b. Dry the seeds well, and apply non-toxic chemicals such as vegetable oils.
c. Dried leaves of lagundi (*Vitexnegundo* L.) can be also used.
d. For seed purposes, treat the seeds with insecticide following recommended dosage.
e. Phosphine fumigation is the only chemical treatment approved for cowpea bruchid control.

General Insect Pest Control Strategies

The following are some strategies to control insect pests of mungbean:

1. **Insect Pest Identification** – to be able to determine what control measure you are going to employ, know what particular pest to control, its life cycle and nature of damage.

2. **Cultural Control** - this includes the different field operations that promote favorable growth of the crop while at the same time could effectively control insect pests by directly destroying them, or interfere with their normal biological processes and make the environment unpleasant for the insect pests such as sanitation and crop rotation.
3. **Mechanical Control** - involves the use of special equipment or operations. Generally, this gives immediate and tangible results. Examples: handpicking and light trapping.
4. **Biological Control** - use of parasites, predators and pathogens to minimize or control the pest. Every pest species has one or more natural enemies which prevent their population from increasing to a disastrous level. Example: application of *Trichogrammachilonis* at the rate of 200 strips per hectare at weekly interval starting 20 days after germination up to flowering stage. Moreover, assassin bug at the rate of 1,000 nymphs or adults per hectare starting from the onset of flowering up to pod development can control lepidopterous insect pests.

Chemical Control – most commonly employed to control or kill pests (also known as pesticides). Effective against large pest populations; act within a short period of time, and are readily available in the market. However, despite their advantages in pest control, the frequent use of pesticides often results in problems such as resistance, adverse effects to non-target organisms, hazardous to users and can lead to environmental contamination. Hence, pesticides should only be used when necessary. It should be integrated with other forms of pest control.

B. Diseases

1. **Cercospora Leaf Spot** (CLS) – caused by fungus *Cercospora sp*., which is prevalent during wet season. The first visible symptom of infection is the appearance of water-soaked spots on the leaves. The spots then turn tan to reddish brown necrotic areas with a small gray center. The individual spots may coalesce causing large dead areas on the leaves.
2. **Powdery Mildew** – caused by *Erysiphepolygoni;* develops under high relative humidity and cool nights. Its first visible symptom is the appearance of small, white, powdery spots on the upper surface of the leaf. The whitish fungal growth occupies part or the entire leaf surface. Infected leaves become yellow, then brown and finally fall off.

Disease Management

d. **Plant high quality, preferably certified seeds**. High quality, certified seeds reduce the possibility of introducing pathogens into the field. It also produces vigorous seedlings that sustain less seed decay and seedling disease.

e. **Practice fungicide seed treatment (for fungal diseases).** Fungicide seed treatment protects seeds and seedlings from seed-borne and soil-borne pathogens. It is inexpensive and effective.

f. **Use recommended seed bed preparation, planting depth, and seeding rates**. This will promote rapid seedling emergence and vigorous seedling growth; and prevent disease infection and seedling decay.

g. **Practice crop rotation with non-legume crops**. Many pathogens survive between cropping seasons on crop debris. Continuous monoculture of crops allows the pathogens to perpetuate and multiply. Crop rotation will reduce the survival of pathogens in the field.

h. **Practice deep plowing to bury plant debris**. Pathogens survive between planting seasons on plant debris. Deep plowing will physically remove plant debris and likewise hasten decomposition. As the debris decays, the pathogens will also die out.
i. **Plant disease resistant cultivars and varieties.** Plant resistance is the most efficient and least expensive disease management practice. However, resistance to all known diseases is not available; thus resistance may not last forever. Pathogens sometimes develop new strains which overcome plant resistance.
j. **Use fungicides only when necessary**. When disease pressure is high, fungicides are effective and profitable. Apply at proper time and rate following label instructions.
k. **Employ appropriate crop management practices**. This includes good drainage, fertilization, irrigation, weed control, and insect management. It promotes healthy, vigorous crop growth that enables the plant to be more tolerant to pathogens.
l. **Disease management is best accomplished using an integrated approach**. This involves incorporating as many of the principles listed above.

C. Weed Control

Weed control is critical when mungbean grows slowly 2-3 weeks after emergence. To minimize weed growth, prepare the land thoroughly before planting. Fifteen days after planting, off-barring should be done to loosen the soil and eradicate weeds. This will be followed by hand weeding to totally eradicate remaining weeds. Right after weeding, immediately do the hilling-up by passing a carabao-drawn plow in between the rows of mungbean crop not only to eradicate remaining weeds but also to improve plant anchorage. Moreover, option of spot weeding should also be done when weed population is high during the growth and development of the crop.

Harvesting

Mungbean is harvested by priming. Harvesting is done 60-70 days after planting. Mature pods turn brown and then black. Begin harvesting as soon as 75% of the pods have dried up. Pick the harvestable pods by hand. Repeat harvesting every 3 to 5 days. The number of primings (number of harvesting) depends on the available soil moisture and fertility, and on the condition of the crop.

Right after harvesting, sun-dry mungbean pods. When pods are sufficiently dry enough, thresh by placing the dried pods in sack and beating it until all seeds severed from the pods. A mechanical rice thresher may be used for large scale production. Take precaution not to damage the mungbean seeds. Clean the seeds and sundry until 12% moisture content is reached.

Post-Harvest

<u>Storage</u>

Store mungbean seeds in tight containers or in nylon/jute sack. Store them in a cool, dry place protected from rodents. Practice good sanitation to prevent storage pest infestation like weevils. You can also mix dried neem seeds or leaves, or dried hot pepper (silinglabuyo) with the mungbean seeds.

Cost of Production and Return on Investment (ROI) for a One-Hectare Land

	ITEMS/ACTIVITY	Unit of Measure	QUANTITY	UNIT PRICE (Php)	Cost/ha (PhP) Conventional	Cost/ha (PhP) Organic
	A. Farm Inputs					
1	Mungbean seeds	kg	20	80.00	1,600.00	1,600.00
2	Inoculant	pack	4	10.00	40.00	40.00
4	Tripple 14	bag	4	1,200.00	4,800.00	-
5	Organic Fertilizer	bag	20	300		6,000.00
6	Insecticide	kg	1	900	900	-
7	Fungicide	kg	0.5	900	450	-
8	Botanical Pesticides (EMS-Plus)	liter	4	300		1,200.00
10	Sacks	piece	50	10	500.00	500.00
	SUB TOTAL				**8,290.00**	**9,340.00**
	B. Labor					
1	Land Preparation	Tractor rental		6,500.00	6,500.00	6500.00
2	Fertilization	MD	(2)(4)	220	440.00	880.00
3	Planting	MD	5	220	1100.00	1100.00
4	Off barring	MD	2	220	440.00	440.00
5	Weeding	MD	15	220	3,300.00	3,300.00
7	Spraying fungicide/insecticide	MD	4	220	880.00	
8	Spraying FPJ/EM5-Plus	MD	6	220	-	1,320.00
9	Hilling-up	MD	2	220	450.00	450.00
10	Spot weeding	MD	5	220	1125	1,125.00
11	Harvesting (3 primings;					
	processing, and drying)	MD	30	220	6,600.00	6,600.00
12	Seed cleaning	MD	2	220	440.00	440.00
	SUB TOTAL				**21,275.00**	**22,155.00**
	CONTINGENCY (10%)				**3,537.00**	**2,867.00**
	TOTAL PRODUCTION COST				**38,907.00**	**31,532.00**
	Gross Production 700 kg clean & dry seeds at P80/kg				56,000.00	56,000.00
	NET INCOME				**17,093.00**	**24,468.00**

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