



DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY

POLE SITAO

PRODUCTION GUIDE



Pole Sitao
Vigna unguiculata subsp. Sesquipedales (L.) Verdc.



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The POLE SITAO Plant

Pole sitao (*Vigna unguiculata* subsp. *Sesquipedales* (L.) Verdc.) has the following names: asparagus bean, garter bean, snake bean, Chinese long bean, Yardlong bean (English); kacang panjang (Indonesian and Malaysian); tao-fak-yao (Thai); dau-dau (Vietnamese); dau-gok (Chinese); lobia (Hindi); and sasage (Japanese). Locally, it is known as sitaw (Tagalog), hantak (Waray), utong (Ilokano), batong (Cebuano) and latuy (Marinduque) .

A herbaceous crop, pole sitao has trifoliate leaves. The flowers are in pairs and borne on the axil of the leaf which vary in color depending on the variety. Calyxes are generally green and purple. It is a viny annual crop that produces 30-60 cm long pods which hang in pairs with many seeds. Pods are either green, dark green, light green or purple. They are quick growing and every other day harvesting is often necessary.

Pole sitao is an important crop in Asian countries like Malaysia, Thailand, Indonesia and the Philippines. It is also considered as one of the most important vegetables in certain parts of Taiwan and China.

In the Philippines, pole sitao is the most popularly produced vegetable among edible legumes because the pods, young shoots as well as the beans are available throughout the year. It is grown in home gardens, on dikes around paddy fields, under partially shaded areas as a companion crop or commercial crop.

The succulent young pods of pole sitao are eaten as whole pods and only need very light cooking. It can also be a good supplement to infant food whether cooked singly or mixed with other vegetables. The young leaves, shoots and sprouted seedlings can also be utilized as vegetables. Juices from the leaves are used for some medicinal properties.

Bureau of Agricultural Statistics (BAS), 2010 showed that the total land area planted to pole sitao is 14, 681 hectares with a total volume of production of 119, 453.02 metric tons. Central Luzon has the highest volume of production (32%), followed by Cagayan Valley (15%) and Davao Region (11%).

Pole sitao is a good source of protein, vitamin A, thiamin, riboflavin, iron, phosphorous and potassium. It is also a very good source of vitamin C, folate, magnesium and manganese. Table 1 shows the summary of nutritional content per 100 g serving of edible portions.

Table 1. Nutritional content of pole sitao pods in a serving of 100 grams (g).

Properties	Amount	Properties	Amount
Water (g)	88.9	Phosphorus (mg)	47.0
Energy (kcal)	43.0	Iron (mg)	0.9
Protein (g)	3.1	Vitamin A (ug)	42.0
Fat (g)	0.2	Thiamine (mg)	0.12
Dietary Fiber (g)	2.2	Riboflavin (mg)	0.11
Carbohydrate (g)	7.2	Niacin (mg)	1.0
Ash (g)	0.6	Ascorbic acid (mg)	22.0
Calcium (mg)	61.0		

Source: The Philippine Food Composition Tables, 1997. Food and Nutrition Research Institute- Department of Science and Technology (FNRI-DOST).

CROP VARIETIES

In 1975, the Bureau of Plant Industry, Economic Garden, Los Banos, Laguna developed the first commercial variety of pole sitao known as BPI-Ps 1 and was approved by the Philippine Seedboard. At present, BPI-LBNCRDC has six (6) varieties registered and released by the National Seed Industry Council (NSIC) for commercialization. NSIC Ps 4 ("Hitik") and NSIC Ps 5 ("Rikit") (Figure 1) are the latest pole sitao varieties approved last 2008. The green podded varieties are BPI-Ps 3 (Figure 2), BPI-Ps 4 (Figure 3) and NSIC Ps 4 while the light green podded varieties are PSB-Ps 2 (Figure 4) and NSIC Ps 5. Seeds of these five (5) varieties of pole sitao are available at the Center.



Figure 1. NSIC Ps5



Figure 2. BPI Ps3



Figure 3. BPI Ps4



Figure 4. PSB-Ps2

Table 2. Other pole sitao varieties from the private seed companies

OWNER	VARIETY	MATURITY (DAT)	FRUIT TYPE		SEASON	FEATURES
			Weight (g)	Color		
Allied Botanical	Greenbelt	53	25	Apple green	Year round	Ideal variety for hot areas. Has excellent shelf life
Allied Botanical	Maranaw	56	24	Light green	Year round	Very vigorous vine. Has very prolific and long pods
Allied Botanical	Negro star	54	23	Dark green with purple tip	Year round	Prolific and vigorous. Very ideal for off-season planting
Pine Valley Corp	Pag-asa Allgrow	50-60 (DAS)	25-30	Light green	Year round	Popular variety with vigorous vines. With half-red and half-white seeds. About 55 cm long.
Pilipinas Kaneko	Arayat green	60-65 (DAS)	30-35		Year round	Light green pods, 65-75 cm long, crispy
Pilipinas Kaneko	Busilak	45-50 (DAS)	25-30		Year round	Light green pod is 60-65 cm long, white seeded
Pilipinas Kaneko	Maxi green	50-6- (DAS)	25-30		Year round	Yellowish, light green pods, 60-65 cm long. Long shelf life.
Allied Botanical	Pole star	47	21-25	green	Year round	Vigorous and high yielding
Pine Valley Corp.	Tender Green Allgrow	55-60 (DAS)	30-35	Light green	Year round	High yielding variety with vigorous and crispy pods. About 60 cm long with brownish red seeds
Allied Botanical	Tri Star	50	21	Dark green	Year round	Has long productive life very prolific

CULTURE AND MANAGEMENT

A. **Soil and Climate Requirements.** Pole sitao is well suited in warm climate at a temperature range of 20-35°C. It can thrive well under full sunlight although it can tolerate partial shading. Higher

percentage of pod set can be achieved when planted in May for wet season and in October-November for dry season. Any type of soil is suited to pole sitao production. However, a friable fertile soil is preferred to obtain healthy growth and high quality pods. The soil must have a pH value of 5.5-6.8.

- B. **Varietal Selection** – Planting right varieties adapted to a specific area may increase yield by as much as 20%. In the varietal selection, there are important considerations to look into:

- a. Adaptability to soil and climate
- b. Maturity
- c. Yield
- d. Disease resistance and insect tolerance
- e. Market/consumers demand

- C. **Land Preparation.** Thorough land preparation is important to obtain high yield since the operation renders the soil for seed germination. Plow the field twice and harrow after each plowing. For single row trellis, make furrows one (1) meter apart and 0.75 meter for A-type trellis before planting. Apply 2-3 tons dried animal manure per hectare while preparing the field.



- D. **Planting.** The seeding rate for pole sitao requires 10-12 kg/ha. For hill method of planting, after basal fertilization with organic and/or inorganic fertilizers, sow 2-3 seeds per hill with a distance of 30 cm between hills and cover lightly with soil. Allow only 2 plants per hill. For drill method of planting, seeds are planted at a depth of 2-3 cm at a rate of 15-18 seeds per linear meter with 100 cm spacing between



rows.

- E. **Mulching.** Use rice straw or plastic mulch particularly during dry season. This method helps to suppress weed growth and to conserve soil moisture.



- F. **Cultivation.** Off-baring and hilling-up should be done after 14 days from emergence or before the plants start to cling on.

- G. **Trellising.** In hill and drill methods of planting, provide poles after 14 days from emergence. Vertical trellis is used for single row plot with a distance between rows of one (1) meter. Ipil-ipil, bamboo and kakawate poles are used 3-4 m apart with in the rows and are secured on top with GI wire #16. Tie the top wire to the stakes at the end of the rows to make the poles stable. Plastic straw is used at the bottom portions in every row. Straw lines are tied vertically from top to bottom in every hill. For double row plots, A-type trellis is spaced apart at 0.75 m. Synthetic straw is also used for the pole sitao to cling on for the trellis.

- H. **Vine Training.** As vines develop, train the crop to cling to the trellis by spreading them evenly across the trellis until they reach the top.



Single-row plot










Double-row plots

- I. **Soil Nutrition.** The general fertilizer recommendation for pole sitao is 135 kg/ha N, 135 kg/ha P_2O_5 , and 112 kg/ha K_2O . However, fertilization should be based on soil analysis. Before first plowing, apply 3 tons of well decomposed manure per hectare. Before planting, apply 3 bags/ha of 14-14-14 as basal fertilizer and sidedress with 1-2 bags of urea (46-0-0) at 1 month after planting. Muriate of potash (0-0-60) should be applied at the rate of 1-2 bags during flowering stage. Foliar fertilizers should also be applied weekly starting at flowering stage.
- J. **Organic fertilizer:** Fertilizer should be bio-degradable materials of microbial, plant or animal origins produced on organic farms such as vermicompost and processed chicken manure. Basal applications of organic compost of 5-10 tons/ha are needed for vegetable legume crops. Supplementary application of Fermented Plant Juice (FPJ) or Fermented Fruit Juice (FFJ) should also be applied twice a week up to fruiting stage.
- K. **Irrigation.** Pole sitao has a relatively deep root system which enables it to tolerate drought. Application of water during the critical growing period of the crop particularly during dry season is required to increase yield. Adequate supply of water is necessary to increase flowering and pod setting. Too much water can result in flower drop and can cause root rot. During wet season, irrigate only when necessary.
- L. **Weed Management.** Weeds may cause considerable yield loss if not controlled early in the season. Hand weeding should be done as often as necessary even after flowering. Perform spot hand weeding.
- M. **Crop Protection.** Insect control for pole sitao depends greatly on the use of chemicals especially during seedling stage. Though there are attempts to practice integrated pest control especially through cultural management practices.



N. Pest and Disease Management

Insects	Image	Control
<p>Beanfly (<i>Ophiomyia phaseoli</i>)</p> <ul style="list-style-type: none"> - very destructive during seedling stage of the plant - adult is a minute jet black fly attacking the seedlings just after germination. The maggots feed as miners working down the petiole into the stem (boring holes on the leaves). <p><u>Severe damage</u> – results to plant wilting and drying-up</p>		<p>Botanical control using neem seeds (50g neem seeds/gal of water). Spray with soap solution (4tbsp soap/16L water). If needed, chemical control for chewing insects.</p>
<p>Aphids (<i>Aphids craccivora</i>)</p> <ul style="list-style-type: none"> - occur usually in dense clusters on the under-surface of leaves. They feed by sucking the sap of the plants especially the tip of the vines. Plants become stunted and leaves curl. It transmits viral diseases. 		<p>Botanical control with hot pepper extracts and soap solution (100g macerated hot pepper/16L water). Crop rotation in severe cases. Chemical control following the recommended rates.</p>
<p>Pod borer (<i>Maruca vitrata</i>)</p> <ul style="list-style-type: none"> - larvae feeds on flower buds and bores into the young pods 		<p>Biological control using <i>Trichogramma</i> spp. parasitoid. Botanical spray of <i>Bacillus thuringiensis</i>. Grow repellent crops such as marigold, basil, onion and citronella. Chemical spray following the manufacturer's recommended rates.</p>
<p>Leafminer (<i>Liriomyza</i> sp.)</p> <ul style="list-style-type: none"> - feeds on the green inner portion of the leaves leaving white zigzag lines. 		<p>Conserve natural enemies like spiders, lacewings and syrphid flies. Provide yellow trap with oil. Intercrop with suitable vegetables like eggplant and okra. Chemical control following the recommended rates.</p>
<p>Leafhopper (<i>Amrasca biguttula</i>)</p>		<p>Spray with soap solution and plant sacrificial crops like okra. Chemical spray following the recommended rates.</p>
Diseases	Image	Control
<p>Mosaic virus</p> <ul style="list-style-type: none"> - the disease is caused by a virus commonly carried by aphids or plant lice, the virus may affect every plant in a field and reduce yield, quality, and selling price. The affected leaves usually have irregularly-shaped light green areas of various sizes. Some puckering and other alternation in leaf shape occur. 		<p>Keep the aphids under control. Plant resistant varieties. Seeds from disease free plants should be used. Rouging and burning of infected plants. Crop rotation in severe cases.</p>

<p>Fusarium wilt/ Root rot - one of the most destructive of all roots organisms attacking beans, the disease is caused by the fungus <i>Fusarium oxysporum</i>). Root disease prevalent after prolonged rain and water logged condition. Causes an internal rotting and brown discoloration of the vascular tissue inside the stem, followed by wilting, becomes yellow and usually die.</p>		<p>The most successful control of the disease is crop rotation. The use of resistant varieties is also one of the most economical measures. Plant in well-drained soils. Spray effective fungicides to control the disease infection in the field.</p>
<p>Rust - disease of the leaves caused by <i>Uromyces phaseoli</i>. The first symptom appears as small white spots or flecks on the underside of the leaves. Within a few days, the spots break open into rust-colored pustules, about pinhead size. A week or so after the pustules appear, the entire leaf begins to turn yellow. Later it turns brown, dries up, and eventually falls off.</p>		<p>Use resistant varieties. Prune infected plant parts.</p>

Source: Fliers. Pole Sitao Production Guide. PCARRD. Information Bulletin No.154-A/2009

For effective control, use resistant varieties and other measures like crop rotation, rouging and pruning of infected plant parts and planting of repellant and companion crops. Organic pesticides such as citronella extract, guyabano seed extract, luyang dilaw and perla soap can also be utilized to control and minimize pests for vegetable legumes, and if needed, the use of chemicals/fungicides will be the last resort in controlling pests and diseases of pole sitao.

- O. **Harvesting.** The young and tender pods of pole sitao are ready for harvest 7-10 days after flowering. Harvesting should be done at 2-3 days interval to prolong the productive life of the plants. Harvesting is done manually. Harvest the pod by holding the stem end before twisting it free. To avoid weight loss, harvesting should be done early in the morning or during the cooler times of the day. The pods should be kept in a shaded area after harvest. To prolong the shelf-life, dip the harvested pods in coconut water for 1 minute. In the Philippines, no attempt has been made to mechanize harvesting.



- P. **Post Harvest Handling.** Separate the marketable and non-marketable pods. Marketable pods are tender, straight, long and unblemished. Non-marketable pods are short, curved, damaged by insects or diseases; and past the picking stage but can still be utilized as vegetable. Pack the harvested pods in plastic sacks, thick lined bamboo baskets, polyethylene bags or wrap with fresh banana leaves. If pole sitao pods cannot be sold or used for 1-3 days, store small quantities in moistened clay jars. Store pods at 12-15°C for not more than 2 weeks at 90% relative humidity if cold storage facilities is available. Keep the pods away from ripening fruits during transport and storage.

Seed Production

Except for isolation and rouging, the cultural management techniques in seed production are similar to fresh pods production.

- A. **Isolation.** The isolation distance depends on the nature of pollination of the crop, whether self or cross pollinated. The isolation distance of pole sitao is 10-50 meters.
- B. **Field Inspection.** It involves identification of a variety and removal of undesirable plants from the main crop through a process termed rouging. The undesirable plants may be weeds, plant of other crop species, plants of another cultivar of the same species, diseased plants and other off-type plants. Rouging should be done at least three times: first at pre-flowering stage; second at flowering; and third at pod formation.
- C. **Harvesting.** Select plants that are vigorous and free from pests and diseases. Harvest pods when physiologically mature or when pods have turned brown and begin to dry. Harvested pods at 20 days after pollination will give the best quality seeds. It may be necessary to harvest 3 times a week at peak harvest. Dry pods should not be allowed to remain in the field to prevent shattering during sunny days rotting or sprouting of seeds within the pods during the rainy days. When dry pods remain longer in the field, these are also being exposed to insect pests.

Place the harvested pods under the sun for 2-4 days until brittle. Threshing is carried on by beating the pods enclosed in net bags or sacks and manually beat with a stick. Separation of seeds from the threshed pods is done by winnowing. Sort out small, wrinkled and seeds damaged by insect. Sun dry the seeds for 4-5 days. Before packaging and storage, seeds must have 10% moisture content (MC). Seeds must be packed in thick plastic, containers or aluminum foil, label with the name of the variety and date of planting then keep in a cool or storage area. In the absence of cold storage, seeds can also be stored in the refrigerator. If properly stored, viability of the seeds becomes longer.

Table 3. Cost and Return Analysis of Pole sitao per hectare (seeds)

Items	Quantity	Unit	Rate/Unit	Amount
A. Labor (250/man-day)				
Mowing	4	hrs.	1500.00	750.00
Plowing (2x)	8	hrs.	1500.00	1,500.00
Manure application	4	MD	250.00	1,000.00
Harrowing (2x)	8	hrs.	1500.00	1,500.00
Rotavation	8	hrs	1500.00	1,500.00
Furrowing	2	MAD	500.00	1,000.00
Planting/basal fertilization	8	MD	250.00	2,000.00
Thinning	2	MD	250.00	500.00
Cultivation (Off-baring and hilling-up)	4	MAD	500.00	2,000.00
Irrigation (2MD-12x)	24	MD	250.00	6,000.00
Side-dressing	2	MD	250.00	500.00
Spraying	8	MD	250.00	2,000.00
Weeding (30MD-2x)	60	MD	250.00	15,000.00
Roguing (2x)	4	MD	250.00	1,000.00
Trellising/Posting (wiring and strawing)	60	MD	250.00	15,000.00
Vine training (10-2x)	20	MD	250.00	5,000.00
Harvesting/hauling	60	MD	250.00	15,000.00
Seed extraction/cleaning/drying	50	MD	250.00	12,500.00
Seed sorting	12	MD	250.00	3,000.00
Seed packaging	2	MD	250.00	500.00
Sub-total				87,250.00
B. Supplies and Materials				
Seeds	12	Kgs	420.00	5,040.00
Manure	60	bags	150.00	9,000.00
Fertilizer- Complete	6	Bag	1200.00	7,200.00
Urea	6	Bag	1300.00	7,800.00
Muriate of Potash	2	bag	2000.00	4,000.00
Foliar fertilizer	2	kg	500.00	1,000.00
Fungicide				1,200.00
Insecticide				10,000.00
Trellising materials				
-Bamboo poles *	3000	pcs	10.00	15,000.00
-G.I Wire # 16 **	300	kg	75.00	5,625.00
Plastic Twine	25	rolls	80.00	2,000.00
Harvesting/Packaging/Drying Materials				
- Sacks	25	Pcs	10.00	250.00
- Sacoline*	30	Meters	50.00	750.00
- Net bag 22 in x 30 in	50	pcs	50.00	2,500.00
Sub-total				62,565.00
C. Power Cost (Electricity)				
				5000.00
Total Cost of Production				154,815.00
Gross Income (420/kg)				294,000.00
Net Income (P)				139,185.00
ROI%				89.9

Seed Yield- 700 kg

*may be used up to 2 seasons

** may be used up to 4 times/season

Table 4. Cost and Return Analysis of Pole sitao per hectare (fresh pods)

Items	Quantity	Unit	Rate/Unit	Amount
A. Labor (250/man-day)				
Mowing	4	hrs.	1500.00	750.00
Plowing (2x)	8	hrs.	1500.00	1500.00
Manure/fertilizer application	4	MD	250.00	1,000.00
Harrowing (2x)	8	hrs.	1500.00	1500.00
Furrowing	2	MAD	500.00	1,000.00
Planting/basal fertilization	8	MD	250.00	2000.00
Thinning	2	MD	250.00	500.00
Cultivation (off-baring and hilling-up)	4	MAD	500.00	2,000.00
Irrigation (2MD-12X)	24	MD	250.00	6,000.00
Side dressing	2	MD	250.00	500.00
Spraying	8	MD	250.00	2,000.00
Weeding (30 MD-2X)	60	MD	250.00	15,000.00
Trellising/Posting (wiring and strawing)	60	MD	250.00	15,000.00
Vine training (10-2x)	20	MD	250.00	5,000.00
Harvesting (Hauling, upgrading, packing)	70	MD	250.00	17,500.00
Sub-total				72,750.00
B. Materials				
Seeds	12	kgs	420.00	5040.00
Manure	60	bgs	150.00	9,000.00
Fertilizer				
14-14-14	3	bgs	1,200.00	3,600.00
46-0-0	2	bgs	1,300.00	2,600.00
0-0-60	2	bgs	2,000.00	4000.00
Foliar fertilizer	2	kg	500.00	1000.00
Insecticides		i		10,000.00
Fungicides				1,200.00
Plastic twine	25	rolls	80.00	2000.00
Packaging materials	500	20 x 30	10.00	5000.00
G.I. wire *	300	#16	75.00	4500.00
Trellis materials**	3,000	pcs	10.00	15,000.00
Sub-total				64,065.00
C. Power Cost (Irrigation)				
Total cost of production				139,315.00
Net Income				74,085.00
ROI%				53.2

Marketable yield – 9,700 kg/cropping

Price is P22.00/kg

Gross income-P213,400.00

*maybe used up to 4 croppings

**maybe used up to 2 croppings

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