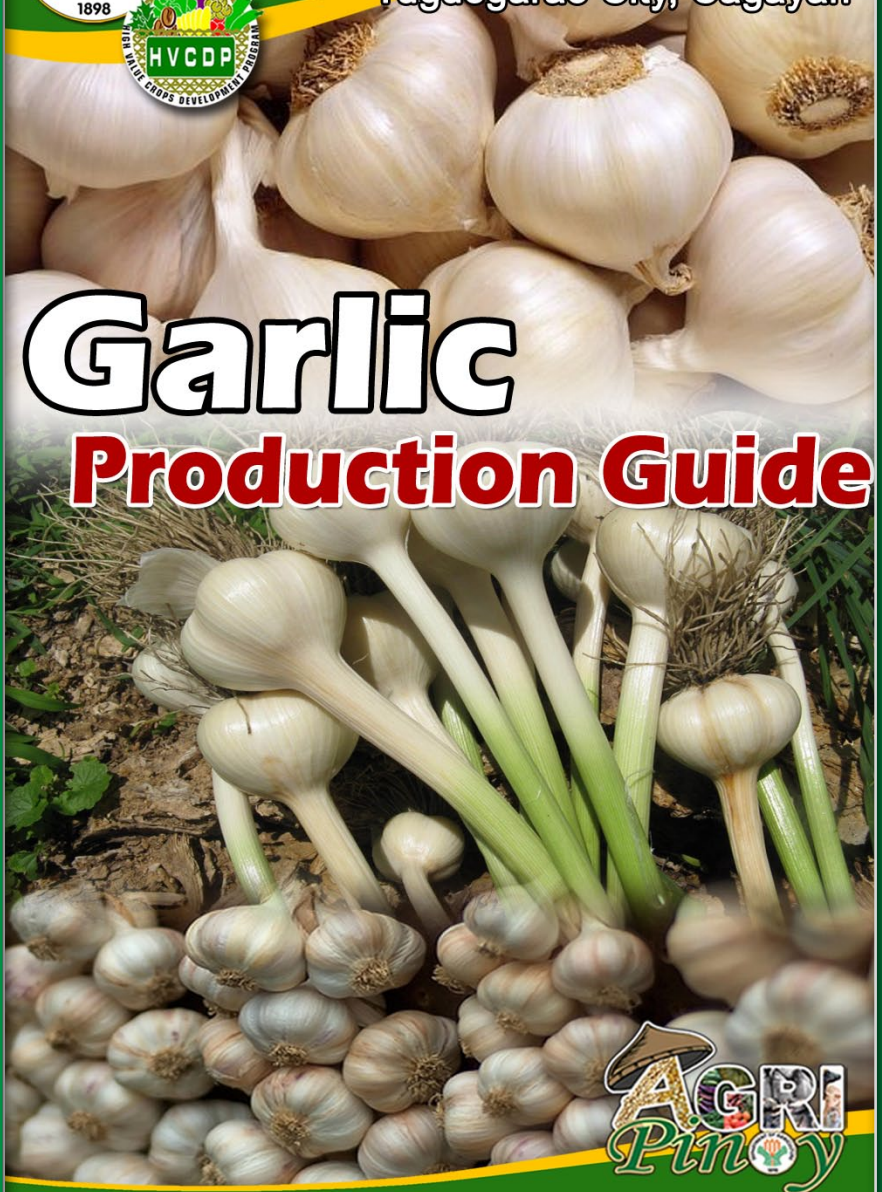
DEPARTMENT OF AGRICULTURE
Regional Field Office No. 02
Tuguegarao City, Cagayan



Garlic
Production Guide

AGRI Pinoy

Garlic

Production Guide

This Publication is a project of the **Department of Agriculture, Regional Field Office No. 02, High Value Crops Development Program**. It contains the most recently available and locally adaptable technical information on **Garlic Production** in Region 02.

November 2012

INTRODUCTION

Garlic (Allium Sativum L.) or "*bawang*" is a perennial herb of the Amaryllidaceae family. The plant produces a bulb which is surrounded by sheaths and is composed of thin – shelled bulblets, clovers, or set, all of which are capable of forming a new plant.

The bulblet in fresh or in processed form has been used as food, condiment, and for medical purposes.

Garlic is a relatively good source of calcium, phosphorus, and potassium. Its leaves are sources of protein and of Vitamins A and C.

Garlic is said to contain antibiotic substances that inhibit the growth of certain bacteria and fungi. People in the rural areas use garlic to treat wounds, toothache, and epilepsy. Scientific experiments in Germany, for instance, have shown that certain compounds in garlic block the blood platelets from forming into blood clots, which could cause heart attacks (coronary thrombosis) and strokes.

The main producers of garlic in Region 2 are the municipalities of Aritao and Bambang, Nueva Vizcaya and Batanes province.

Importance

- Used in all food preparation for its pungent flavor as a seasoning or condiment
- Indispensable in the Filipino diet
- Known for its health benefits, which are antibacterial, viral, fungal and prevents heart disease.

Garlic Varieties in Region 02

Itbayat Variety

	Quantity
• Average Plant Height (cm)	54.1
• Growth Duration (DAP)	141
• Average Weight (kg)	3.69
• Average Weight of 100 bulbs (kg)	1.84
• Average Diameter (cm) of bulb	4.74
• Average No. of Bulbs per kg	32
• Average No. of Cloves per kg	368
• Average No. of Cloves per Bulb	12
• Average Yield (MT/Ha)	4.01

Ilocos White

- Has little purple but commonly has white scales
- 2-4 cm in diameter
- 90-110 days maturity after planting
- 3 to 4MT potential yield per hectare
- Moderately resistant to pests and diseases

Batanes Red Garlic

• Average Plant Height (CM)	54.01
• Growth Duration (DAP)	141
• Average Weight (kg)	3.69
• Average Weight of 100 bulbs (kg)	1.84
• Average Dimension (cm) of bulb	4.74
• Average no. of bulb per kg	32
• Average no. of cloves per kg	368
• Average no. of cloves bulb	12
• Average yield (MT / HA)	4.01

CULTURAL MANAGEMENT

Soil and Climatic Requirements

Garlic can be grown in different types of soil. However, sandy, silt and clay loam are recommended for commercial production. The soil should be fertile, rich in organic matter, well-drained, and capable of holding adequate moisture during the growing period.

Garlic grows favourably in areas with type I and IV climate, Type I climate is characterized by a wet season that usually occurs from May to October and dry season from November to April while type IV climate such as in Batanes is characterized by a well distributed rainfall throughout the year. Garlic does not grow well in areas with excessive rainfall. Locally, garlic grows best in gently sloping areas.

Land preparation

The two types of land preparation for garlic production are with tillage and without tillage or zero tillage.

1. With tillage

This method is similar to that for corn, soybean, and other upland crops. The field is plowed and harrowed twice or more at seven days interval or less. A tractor-mounted rotavator can also be used. Canals are usually constructed around the area for drainage purposes.

2. Without tillage

This method of land preparation is usually practiced in Itbayat, Batanes after the harvest of palay. Rice straw and weeds are removed and used as mulching materials. Planting is done by dibbling using a pointed wooden stake.

Selection of Planting Materials

Fully-matured and well-developed bulbs of medium to-large cloves should be selected as planting materials. These should be free from diseases and mechanical damage. A hectare of land will require about 400-700 kg of seeds depending on the size of the bulbs and the distance of planting.

Clove/Seed Preparation

The planting material is prepared first by separating the clove from one another. The cloves from the outer parts of the bulb are the best planting material. Large bulbs contain 10-14 cloves. When there is a shortage of planting materials, the inner can be used also but these should be separated from the outer cloves.

Time of Planting

Planting for garlic is usually done from September to November. December planting tends to produce smaller bulbs especially in the latter parts of the month due to infestation of thrips and mites, and the bulbs are sometimes affected by early rain. For the province of Batanes, planting time is from the month of October to November & harvesting from February to March. For Nueva Vizcaya, planting is from the month of November to December and harvesting is from the month of March to April.

Distance of Planting

The distance of planting varies from 15 centimeters (cm) to 20 cm x 10 cm to 25 cm. Planting is done using dibble or pointed stick to insert two-thirds of the length of the clove vertically into the soil or about 2 cm to 3 cm deep.

Mulching

Mulch is applied after planting. Mulch is evenly laid on the field with a thickness of 3-5 cm. Rice straw and cogon is commonly used as mulching material in Batanes. Other mulching materials that can also be used are hulls, saw dust, grasses, and polyethylene or plastic sheet. Mulch controls soil moisture as well as the growth of weeds.

Fertilization

Before planting, the soil should be analyzed to determine the type and amount of fertilizer needed to be applied. Handy soil-test kits are available in the different local offices of the Department of Agriculture throughout the country. This simple and easy-to-operate kit measures soil fertility and pH value.

In the absence of soil analysis, the results of a local fertilizer study can be used as a basis of fertilizer application.

Soil Type	Fertilizer Recommendation Per Hectare		
Sandy loam	90-60-60 NPK or	8-9 bags and 1.5 bags	14-14-14 46-0-0
Clay loam	80-60-60 or	8-9 bags and 1.0 bag	14-14-14 46-0-0
Clay	90-30-30 or	4.0 bags and 2.0 bags	14-14-14 46-0-0

Application of organic fertilizer is found to be more effective in garlic production. Organic fertilizer does not only provide macro and micro nutrients but also some beneficial microorganisms. It also improves the physical, chemical, and biological conditions of the soil. Further, it has no known harmful effect on the ecology as well as on the crops. The recommended rate is one (1) kg organic fertilizer per square meter or 200 bags per hectare.

Irrigation

In preparing for planting, it is necessary to irrigate the field a day or two days earlier if soil moisture is not sufficient. In case the soil becomes too wet after irrigating, the field should be allowed to dry until the desired moisture level is attained.

Garlic produces an average of 65 roots per plant. In clay loam soil, the roots dig down as deep as 59 cm. Enough moisture is essential within the root zone during the vegetative growth. The frequency of irrigation depends on the soil type and occurrence of rainfall during the growing period. Clay loam is irrigated thrice. Sandy soil requires a more frequent irrigation. Flash irrigation can be applied when crevices or cracks on clay loam soils appear. Water should never be allowed to stay in the field beyond six hours. Irrigation starts before planting and ends 70-85 days after planting.

CROP PROTECTION

Weed control

Generally, garlic is grown under mulch. Weeds appearing in the mulch should be removed by hand pulling or with the used of a narrow-blade hand trowel.

MANAGEMENT OF INSECT PESTS AND DISEASES

Thrips *(thrips sp)*

Both nymphs and adults feed on the plant. They suck the sap of the plant from younger leaves to the growing points. The older leaves become withered or blasted in appearance.

Control – the thrips population is at its peak usually from late January to March. In areas with thrips infestation, early planting, possibly in September or October, is recommended.

Mites *(acerian tulipae)*

The pest is either seed-borne or mulch-borne. The affected plants become twisted and distorted with yellowish or pale-green streaks on the leaves. The leaf blade may not emerge readily from the cloves and the leaves separate poorly after emergence. The damage is called "tangle top."

Control – for piece treatment of seeds, apply chemicals recommended for the control of mites. For field infestation, apply the recommended chemicals as early as the sign of infestation appears and repeat at 7 to 10 days interval until the pest is controlled.

DISEASES

Purple blotch

The disease is caused by Alteria porri (ellis) Cif. , a fungus. The margin of leaf has shades of red purple surrounded by a yellow band. The infected leaves turn yellow.

Control – use Dethane 45, Manzate 200, WP and other recommended fungicides. The frequency and dosage of application are indicated in their labels which is to be followed strictly.

Cercospora leaf spot

The causal organism is Cercospora duddiae Welles, a fungus. Lesions penetrate through the young leaves. They starts as small circular chlorotic spots 3-5 mm in diameter. After a fusion of the original lesions, the disease progresses rapidly and eventually the leaf dies.

Fusarium bulb rot- the causal organism is a fungus. It is a soil-borne disease. The leaves of the affected plants show progressive yellowing and drying from the tip. At the advance stage of the disease, roots and bulb show semi-watery rotting.

Control- use disease-free planting materials. Rotate the crop at least every four years. Fallow the field for one season. Plow and harrow or rotavate the area several times for the whole dry season.

HARVESTING AND POSTHARVEST OPERATIONS

Garlic matures 90 to 120 days after planting. Generally, early planting has a longer period of maturity than the late planting. Indices of maturity are the softening of the main stem above the bulb and the yellowing of 75% of the leaves.

Harvesting / Sundrying

It requires pulling the individual plants by hand. The harvested bulb can be sun or air-dried. Sun drying ranges from 3 to 4 days.

For Bundling

It involves tying together 50 to 100 pieces of bulbs.

2006-2011 Regional Area, Production and Yield

Year	Area (HA)		Volume (MT)		Total
	Batanes	Nueva Vizcaya	Batanes	Nueva Vizcaya	
2006	94	24	263.2	84	347.2
2007	77	32	238.7	128	366.7
2008	73	33	219	151	370.0
2009	86	31	275.2	156	431.2
2010	79	29	260.7	140	408.7
2011	61	30	217.5	132	361.5
Total	**511.2**		**1,600.80**		

Source: Bureau of Agricultural Statistics (BAS), 2011

STORAGE

Garlic is rarely kept in cold storage. The farmers store their produce under ambient storage conditions in several ways:

By hanging the bundles in rows with bamboo stick or lumber in a well ventilated place or above the store in the kitchen. The smoke drives away insects and prevent them from damaging the bulbs.

To minimize pest infestation during storage, clean and dry the area. Before the stocks are stored, spray the area with Malathion or other insecticides recommended for the control of storage pest. Regularly spray the surrounding with the recommended insecticides to prevent the occurrence of insect pests.

COST AND RETURN ANALYSIS per HECTARE

A. Laboratory Inputs / Hectares

Particulars	Unit	Quantity	Unit Cost	Total (P)
a. Land Preparation				2,500
1. Clearing	MD	10	250	5,000
2. Plowing 1	MD	10	500	2,400
3. Harrowing 1	MD	6	400	2,400
4. Plowing 2	MD	6	400	1,250
5. Application of Organic Fertilizer	MD	5	250	7,500 500
6. Levelling and Pulverizing	MD	30	250	
7. Staking	MD	2	250	
Sub Total				**21,550**
b. Crop Establishment				
1. Planting	MD	30	250	7,500
2. Mulching	MD	30	250	7,500
Sub Total				**15,000**
c. Weed Management				
1. Hand weeding 1	MD	10	250	2,500
2. Hand weeding 2	MD	10	250	2,500
Sub Total				**5,000**
d. Pest Management				
1. Botanical Pesticide	MD	3	250	750
Sub Total				**750**
e. Harvesting				
1. Pilling	MD	20	200	4,000
2. Cutting and Drying (2 persons for 10 days)	MD	20	200	4,000
3. Sorting and Bagging	MD	5	250	1,250
Sub Total				**9,250**
f. Marketing				
1. Labor	MD	10	250	2,500
Total Production and Post Production				**54,050**

B. Material Cost				
1. Seeds	kgs.	400	100	40,000
2. Fertilizer (organic)	kgs.	10,000	2.0	20,000
3. Botanical Pesticide	ltrs.	10	100	1,000
4. Fuel	ltrs.	20	73	1,460
5. Snacks	pcs.	200	10	2,000
1 miscellaneous				2,000
Sub Total				**66,460**
Sub Total A and B				**120,510.00**
Marketing Cost (packing and transport)				10,000.00
Contingencies – 15 % Labor and Material Cost				18,076.50
Grand Total A+B+C+D				**148,586.50**

Estimated yield/ ha. (kgs) *4,000.00*
Less : Returned four sacks *600.00*
10% damaged *400.00*
Net yield for sale (kgs) *3,000.00*
Estimated Group Income @ 80.00 / kg *240,000.00*
Estimated Net Income *91,413.5*
Returned on Investment (ROI) *61.52*
Break Even Price *37.15*

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