

Marketing of GARLIC

Problems & Prospects



Agriculture Marketing
Information Service

Garlic (*Allium sativum*) most often used as a seasoning or a condiment is a perennial plant in the family Alliaceae and genus Allium, closely related to the onion, shallot, and leek. It does not grow in the wild, and is thought to have arisen in cultivation, probably descended from the species *Allium longicuspis*, which grows wild in south-western Asia. Garlic has been used throughout all of recorded history for both culinary and medicinal purposes.

The portion of the plant most often consumed is an underground storage structure called a head. A head of garlic is composed of a dozen or more discrete cloves, each of which is a botanical, an underground structure comprised of thickened leaf bases. Each garlic clove may often be composed of just one leaf base, unlike onions, which almost always have multiple layers. The above-ground portions of the garlic plant are also sometimes consumed, particularly while immature and tender. Garlic has a powerful pungent or "hot" flavor when raw, which mellows considerably when it is cooked. Raw or cooked, garlic is noted for its strong characteristic odor.

History

The origins of garlic are not fully certain because of its wide cultivation. It is related to onions and lilies, and cultivated in the same manner as the shallot. From the earliest times garlic has been used as an article of diet. It is very widely used in Lebanese cuisine. Many Lebanese salads contain a garlic sauce. It formed part of the food of the Israelites in Egypt and of the labourers employed by Khufu in constructing the pyramid. Garlic is still grown in Egypt, but the Syrian variety is the kind most esteemed now. It was consumed by the ancient Greek and Roman soldiers, sailors and rural classes and by the African peasantry. Galen eulogizes it as the "rustic's theriac" (cure-all) and Alexander Neckam, a writer of the 12th century recommends it as a palliative of the heat of the sun in field labor.

Garlic was rare in traditional English cuisine (though it is said to have been grown in England before 1548), and has been a much more common ingredient in Mediterranean Europe. The inhabitants of Pelusium in lower Egypt, who worshipped the onion, are said to have had an aversion to both onions and garlic as food.

Compositions

The percentage composition of the bulbs is given as water 84.09 %, organic matter 13.38 %, and inorganic matter 1.53 % that of the leaves is water 87.14 %, organic matter 11.27 % and inorganic matter 1.59 %. When crushed or finely chopped garlic yields allicin, a powerful antibiotic and anti-fungal compound (phytoncide).

Factors Responsible for Sharp Flavor

Like other members of the onion family, garlic actually creates the chemicals that give its sharp flavor when the plant's cells are damaged. When a cell of a garlic clove is broken by chopping, chewing, or crushing, enzymes stored in cell vacuoles trigger the breakdown of several sulfur-containing compounds stored in the cell fluids. The resultant compounds are responsible for the sharp or hot taste and strong smell of garlic. Some of the compounds are unstable and continue to evolve over time. Among the members of the onion family, garlic has by far the highest concentrations of initial reaction products, making garlic much more potent than onions, shallots, or leeks. Although people have come to enjoy the taste of garlic, these compounds are believed to have evolved as a defensive mechanism, deterring animals like birds, insects, and worms from eating the plant.

A large number of sulfur compounds contribute to the smell and taste of garlic. Diallyl disulfide is believed to be an important odor component. Allicin has been found to be the compound most responsible for the spiciness of raw garlic. This chemical opens thermoTRP (transient receptor potential) channels that are responsible for the burning sense of heat in foods. The process of cooking garlic removes allicin, thus mellowing its spiciness.

Culinary Uses

Garlic is widely used in many forms of cooking for its strong flavor, which is considered to enhance many other flavors. Depending on the form of cooking and the desired result, the flavor is either mellow or intense. It is often paired with onion, tomato, and/or ginger. In culinary preparation, it is necessary to remove the parchment-like skin



from individual cloves before chopping. Lightly crushing the cloves with the ball of the hand or flat of a knife makes this job much easier. Almost every cuisine on our planet has found an important role for garlic. Europeans mince it raw and add it to salad dressings, or sauté it and use it to flavor their sauces. Asian cooks add it to their stir-fries; Indian cooks to their curries; Hispanic cooks to meats and vegetables. And Americans have lately taken a fancy to roasting whole bulbs, and then spreading the garlic like a soft cheese on bread or crackers.

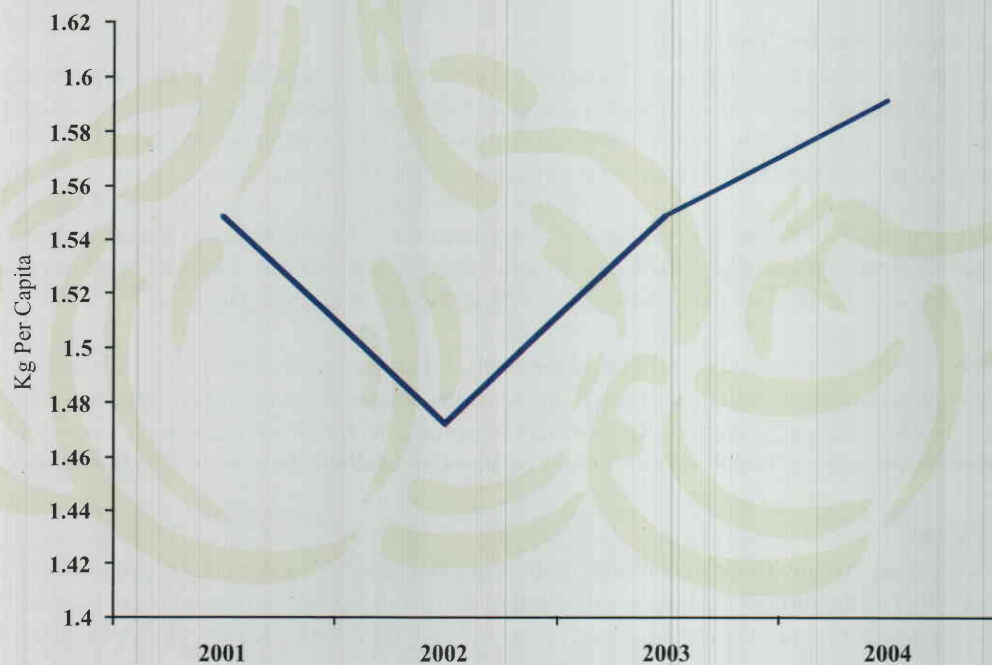
World Annual Consumption of Garlic

Kg per capita

Sr. No	Country	2001	2002	2003	2004
1	Korea South	7.53	7.25	6.92	6.74
2	China	5.36	5.81	6.43	6.73
3	Kyrgyzstan	5.93	1.97	3.78	5.03
4	KoreaNorth	3.60	3.58	3.77	3.75
5	Romania	3.44	3.14	3.64	3.17
6	Ukraine	2.51	2.66	2.06	2.56
7	Myanmar	1.64	2.05	2.55	2.43
8	Trinidad and Tobago	2.04	2.37	2.08	2.42
9	Thailand	1.93	1.81	2.12	2.41
10	Malaysia	2.31	2.83	1.71	2.39
11	Serbia and Montenegro	2.47	2.62	1.96	2.38
12	Guyana	2.68	2.89	2.58	2.37
Top 12 Average		3.45	3.25	3.30	3.53
85	Pakistan	0.51	0.50	0.65	0.54
Other 147 Countries		0.68	0.67	0.70	0.70
World Total		1.55	1.47	1.55	1.59

Source FAO

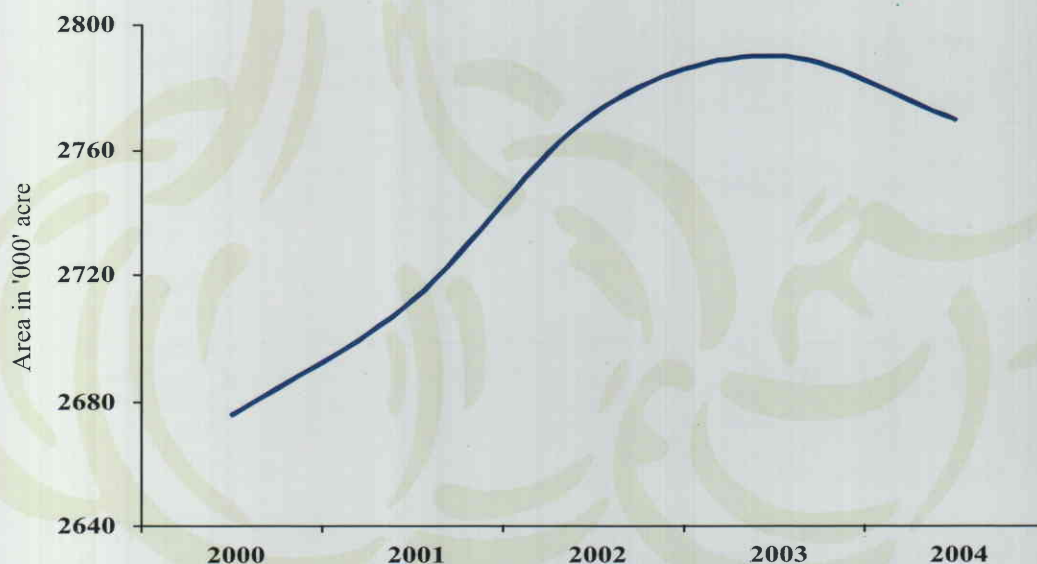
Statistics reveal that world garlic consumption trend has showed a slight increase over the years. South Korea and China consume nearly ten percent of world consumption volume. Where as ten other large consumers make this share up to one third of world consumption. Pakistan is at 85th position in the world and the per capita consumption of garlic has showed insignificant changes.



Garlic Cultivation in World

World population is increasing over time and on the same line garlic consumption is increasing. Accordingly its cultivation has shown an increasing trend over the last 5 years to fulfill the increasing requirements.

World Garlic Cultivation Trend



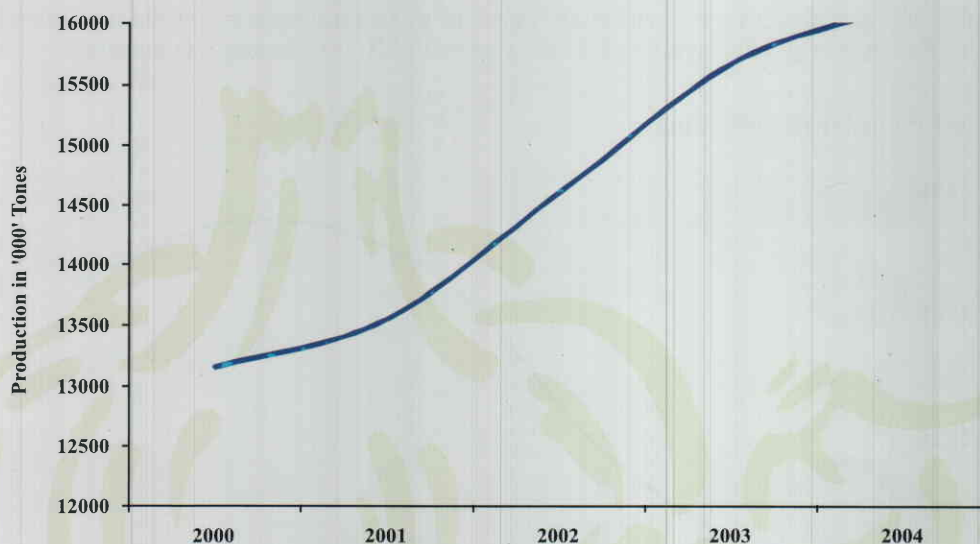
Garlic Cultivating in Leading Countries

China has the maximum share in the acreage under the garlic i.e. 56.85 percent. India and Russian Federation stand at 2nd and 3rd position with a share of 10.71 and 2.73 percent respectively. Pakistan stands at 19th position with a nominal share of 0.61 percent in world acreage under garlic. The area under garlic in top producing countries along with their respective share in world is given in the table.

Sr.No.	Country	2000	2001	2002	2003	2004	%age share
1	China	1383	1445	1550	1563	1575	56.85
2	India	308	297	297	297	297	10.71
3	Russian Federation	69	74	74	74	76	2.73
4	Korea, Republic of	111	92	82	82	75	2.70
5	Spain	56	59	59	54	59	2.11
6	Myanmar	41	46	47	52	54	1.96
7	Bangladesh	33	33	35	36	52	1.87
8	Ukraine	58	52	52	51	48	1.75
9	Turkey	35	37	37	47	42	1.52
10	Thailand	58	55	54	38	42	1.50
Top Ten		2153	2189	2287	2294	2318	83.70
19	Pakistan	21	20	17	17	17	0.61
Other 70 Countries		502	504	467	479	435	15.69
World Total		2676	2712	2772	2790	2770	100.00

Source FAO

Garlic Production in World



Top Ten Garlic Producers

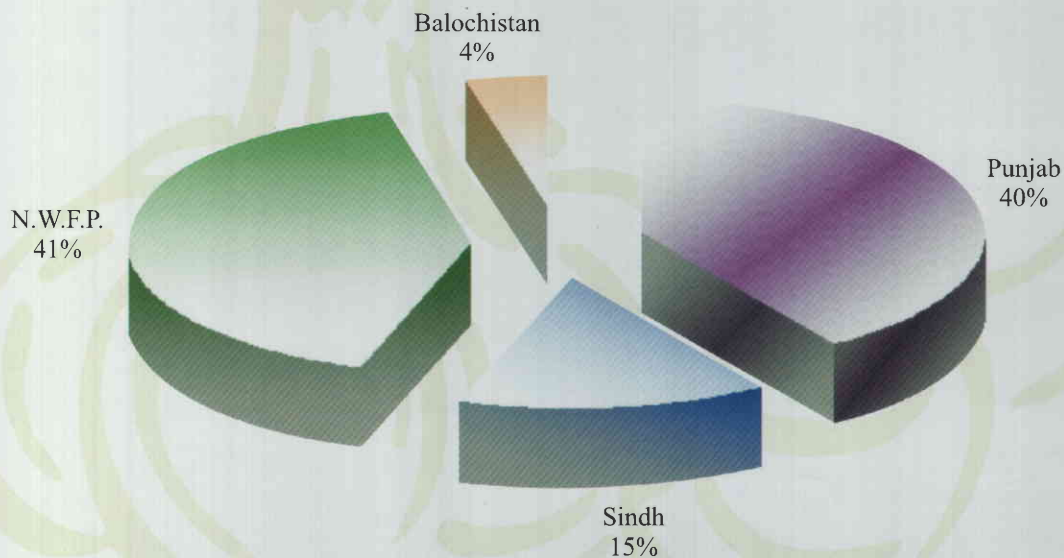
China is the largest producer of garlic with a share of 65.60% in total world production and India stands at 2nd with a share of 3.10%. Pakistan stands at 20th position with a share of 0.35% in world garlic production. Other 70 garlic producing countries contribute 8.76% of the world garlic production. The top ten garlic producing countries along with their respective share in world production is given in the table.

Sr.No.	Country	2000	2001	2002	2003	2004	%age share
1	China	7486	7894	9080	10078	10593	65.60
2	India	525	497	500	500	500	3.10
3	Korea	474	406	391	379	358	2.22
4	U.S. A	253	267	256	283	237	1.47
5	Russia	195	228	230	220	236	1.46
6	Egypt	267	215	190	208	188	1.16
7	Spain	163	183	195	170	168	1.04
8	Argentina	149	134	125	146	143	0.88
9	Ukraine	127	127	132	103	131	0.81
10	Myanmar	67	82	97	120	121	0.75
Top Ten Total		11706	12034	13199	14210	14679	90.90
20	Pakistan	76	64	57	58	56	0.35
Other 70 countries		1384	1457	1355	1402	1414	8.76
World Total		13166	13555	14610	15670	16149	100.00

Source FAO

Garlic Cultivation in Pakistan

Garlic is a regular kitchen item, used in small quantity but in preparation of mostly all types of curries. It is an important condiment and successfully cultivated all over the Pakistan. Generally it is not cultivated as cash crop but each grower brings some area under garlic cultivation, according to his family need. Some areas in Punjab & N.W.F.P. Produce garlic at large areas to suffice the market need. More than 57 thousand tons of garlic is produced in Pakistan from an area of 17.30 thousand acres. The provinces of Punjab and N. W.F.P contribute major portion of Production and their share is almost equal about 40 % for each making 80 %of the total production of the country. The Sindh province contributes about 15% of the total production while Balochistan contributes insignificant share of total production i.e. 4%.



Province wise Area of Garlic in Pakistan

Year	Punjab	Sindh	N.W.F.P.	Balochistan	Pakistan
1995-96	6.42	6.92	8.40	0.74	22.49
1996-97	6.42	6.92	6.42	1.24	21.00
1997-98	6.67	6.92	6.92	1.24	21.75
1998-99	7.17	6.92	7.17	1.48	22.73
1999-00	7.41	6.42	6.18	1.24	21.25
2000-01	6.42	5.93	5.68	1.48	19.52
2001-02	6.42	4.20	5.68	0.99	17.30
2002-03	6.67	4.45	5.44	0.74	17.30
2003-04	6.67	4.94	4.94	0.74	17.30
2004-05	6.67	4.20	4.94	0.49	16.31
2005-06	6.92	4.94	4.70	0.74	17.30

Source: Agriculture Statistics of Pakistan

Garlic a Rabi crop and is sown in Oct-Nov. Green garlic is harvested in March and in April dry garlic arrives in markets. Garlic cultivation in Pakistan has shown a declining trend from 2000-01 as for the first half of the previous decade a static trend with a slight shift over was shown.

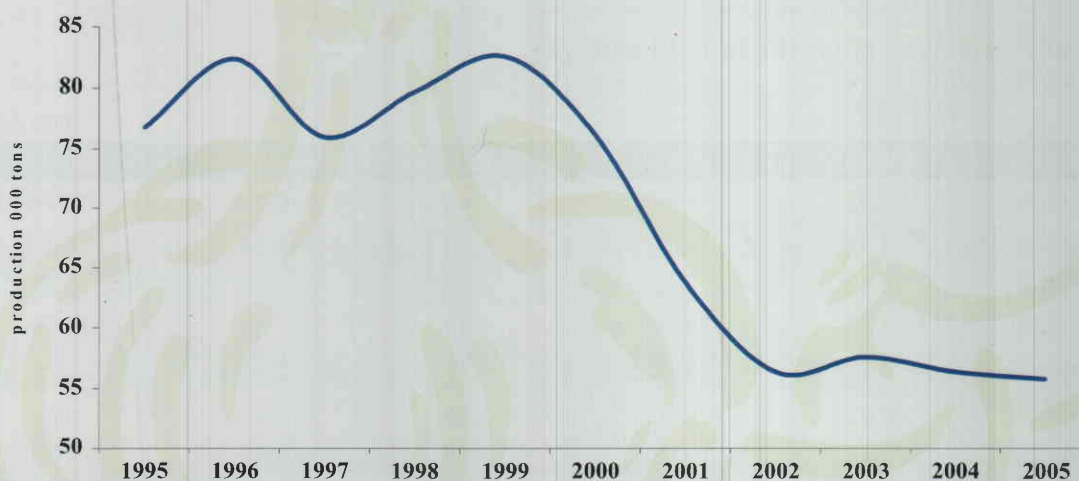
Garlic Production in Pakistan

Overall garlic production is decreasing. It has declined from 82.5 thousand tones in 1995-96 to 57 thousand tons in 2005-06, with 32% decrease over the decade which is shown below

000 Tons					
Year	Punjab	Sindh	N.W.F.P.	Balochistan	Pakistan
1995-96	26.80	17.00	35.80	2.90	82.50
1996-97	27.80	17.30	27.60	3.40	76.10
1997-98	28.90	17.40	29.60	3.90	79.80
1998-99	30.00	17.50	30.90	4.30	82.70
1999-00	31.60	14.60	26.90	3.20	76.30
2000-01	22.20	12.00	25.40	4.30	63.90
2001-02	21.10	7.30	24.9	3.20	56.50
2002-03	22.40	8.20	24.6	2.50	57.70
2003-04	22.90	9.70	22.3	1.60	56.50
2004-05	22.70	8.20	22.8	2.20	55.90
2005-06	22.90	10.4	21.6	2.4	57.3

Source: Federal Bureau of Statistics

Garlic Production Trend in Pakistan

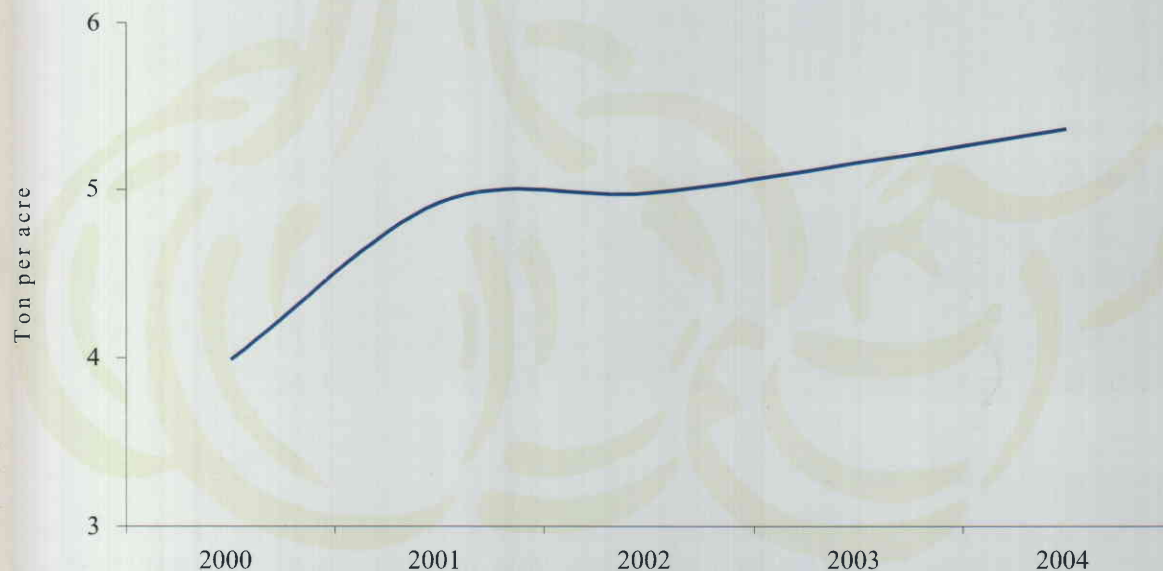


Garlic Yield

Netherlands leads the world in per acre yield of garlic with a figure of 19.42 tons. The average yield obtained by ten leading garlic producers is more than 8 Tones per Acre. In Pakistan garlic yield is below the world average i.e.

3.43 as compared to that of 5 tones per acre for the world. Jordan, the runner up in the race of garlic yield . There is great scope of increasing production from the same area by increasing per acre yields as Pakistan. Average yield of garlic for whole world is increasing.

World Average Yield Trend of Garlic



Leading Countries in Garlic Yield

Sr. No.	Country	2002	2003	2004
		Yield (Tones/Acre)		
1	Netherlands	19.42	19.42	19.42
2	Jordan	13.56	14.35	12.86
3	Egypt	8.87	8.84	9.11
4	Tajikistan	4.63	5.71	8.09
5	U. S.A	7.81	8.09	7.50
6	Haiti	8.90	8.09	7.42
7	China	5.86	6.45	6.73
8	Sudan	6.44	6.44	6.44
9	Ethiopia	5.94	5.99	5.99
10	Iran	5.78	5.78	5.78
Top Ten Average		8.72	8.92	8.93
30	Pakistan	3.29	3.32	3.43
Other 70 Country		2.53	2.52	2.73
World Average		4.85	4.92	5.00

Source FAO

Garlic Yield in Pakistan

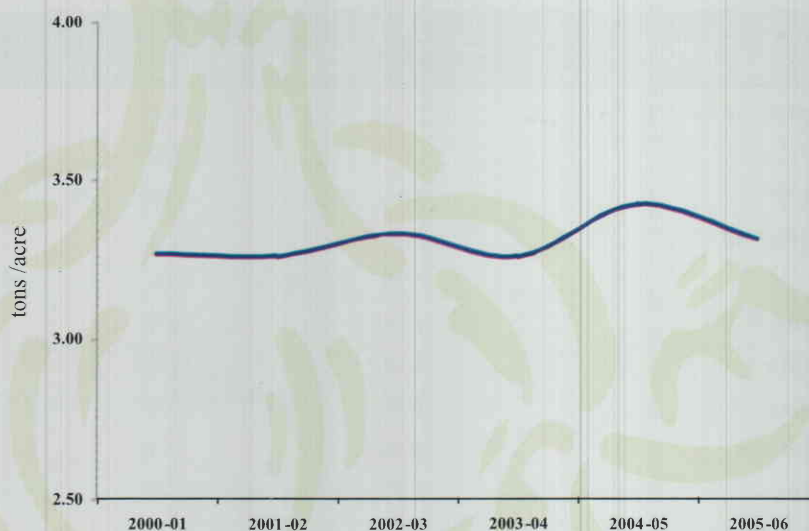
Tons per Acre

Year	Punjab	Sindh	N.W.F.P.	Balochistan	Pakistan
1994-95	4.25	2.43	4.17	3.64	3.66
1995-96	4.17	2.46	4.26	3.91	3.67
1996-97	4.33	2.50	4.30	2.75	3.62
1997-98	4.33	2.51	4.28	3.16	3.67
1998-99	4.19	2.53	4.31	2.90	3.64
1999-00	4.26	2.27	4.35	2.59	3.59
2000-01	3.46	2.02	4.47	2.90	3.27
2001-02	3.28	1.74	4.38	3.24	3.27
2002-03	3.36	1.84	4.53	3.37	3.34
2003-04	3.43	1.96	4.51	2.16	3.27
2004-05	3.40	1.95	4.61	4.45	3.43
2005-06	3.32	2.10	4.61	3.24	3.32

Source: Federal Bureau of Statistics

Over the past decade garlic yield has shown no improvement rather slightly decreasing trend is depicted. Where as at world average level, garlic yield has shown an increasing trend. When compared with other garlic producing countries Pakistan is lagging fr behind i.e. at 30th Position. The following graph depicts the yield trend of garlic in Pakistan

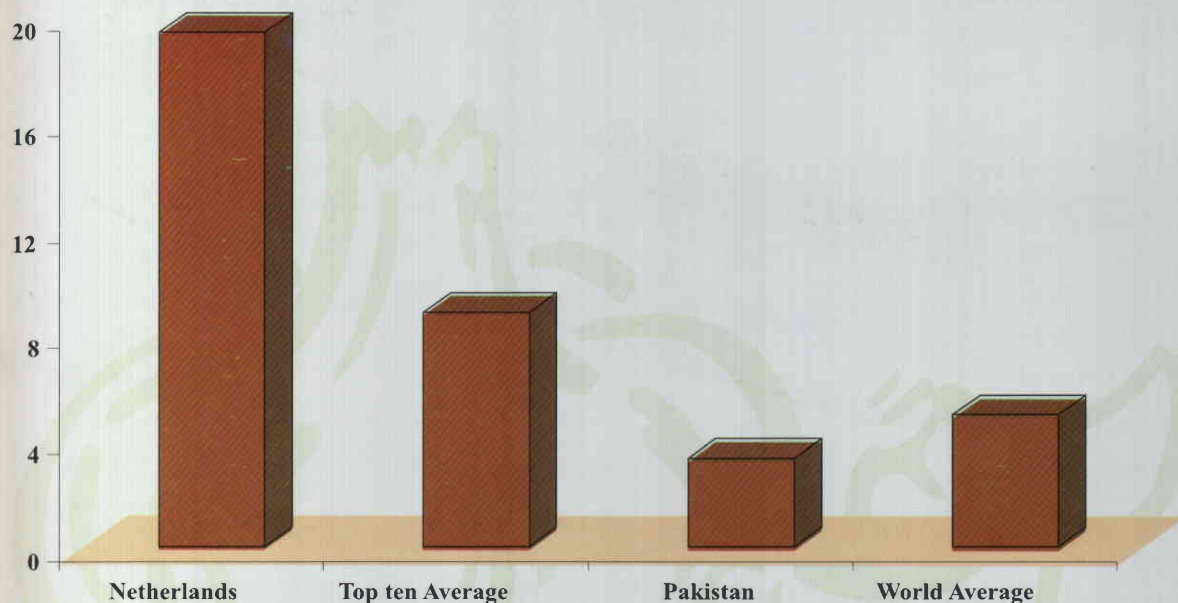
Garlic Yield Trend in Pakistan



World Yield Comparison (Tons per Acre)

Pakistan is lagging far behind in the per acre yield of garlic that needs to be addressed to balance the domestic market needs. Non adoptability of the high yielding varieties and poor farm management practices are the main

reasons for the low yield of garlic. The pungency of garlic is the main character of the local (desi) cultivars that is not present in the varieties presently imported in our markets. The yield of pungent varieties is generally lower than non-pungent varieties. New varieties need to be evolved with pungent characters giving high yield. The garlic yield comparison of Pakistan with world average and the world highest is given below:



China is the largest exporter of garlic and enjoys monopolistic position with more than 77 per cent share in world export volume. Whereas Argentina, Spain and Malaysia are the next in line contributing about 10 percent in world trade. Pakistan is 29th garlic exporting country in the world with a nominal share. The following table indicates the share of major exporters in the world trade of garlic.

Leading Exporters of Garlic

'000' tons

Sr.No.	Country	2001	2002	2003	2004	%age Share
1	China	572126	1057767	1143501	1128071	77.83
2	Argentina	82259	62380	86709	100637	6.94
3	Spain	56780	56749	57870	65993	4.55
4	Malaysia	13357	21516	34496	50415	3.48
5	France	17385	18148	13826	12314	0.85
6	Italy	7721	8466	9426	10256	0.71
7	Mexico	17472	12012	10565	9357	0.65
8	Netherlands	19185	9467	9457	8945	0.62
9	United Arab Emirates	4150	24633	18744	7978	0.55
10	Chile	10467	10716	11436	7535	0.52
Top Ten Total		800902	1281854	1396030	1401501	96.69
29	Pakistan	1561	2479	2161	681	0.05
Other 70 Countries		60837	58748	46584	47274	3.26
World Total		863300	1343081	1444775	1449456	100.00

Source FAO

Leading Importers of Garlic

'000' tons

S.No	Country	2001	2002	2003	2004	%age share
1	Indonesia	205	226	219	244	19.43
2	Malaysia	68	89	76	114	9.07
3	Brazil	78	79	92	10	8.07
4	Viet Nam	5	67	92	81	6.49
5	U S A	37	48	46	56	4.47
6	Thailand	0	16	45	56	4.43
7	Russian Federation	17	27	49	44	3.49
8	Italy	28	28	32	32	2.53
9	Pakistan	16	25	49	32	2.52
10	Japan	29	26	28	29	2.30
Top Ten total		482	633	726	787	62.78
Other 142 Countries		361	490	490	467	37.22
World Total		843	1123	1216	1254	100.00

Source FAO

Import of Garlic in Pakistan

During the year 2004-05 Pakistan imported 51 thousand tons of garlic and 93 percent of this volume garlic was imported from China. Pakistan heavily depends upon garlic imports to meet the market needs due to low production, higher domestic requirement and lack of any physical infrastructure available for efficient post-harvest management and processing. To reduce this dependency there is need to concentrate on improving production volume, quality, availability and post-harvest management and value addition.

The potential for increasing production volume of garlic and its marketing in value added forms i.e. peeled, powdered, flakes and many others is very high, given the per acre yield of garlic is increased with accomplishment of the quality requirement That is possible to attain only with the collective efforts of farmers, processors and traders. During the year 2004-05, volume of garlic import in Pakistan is given below:

Countries	Import	%age share
Afghanistan	9	0.02
Australia	46	0.09
China	47216	92.53
Dubai	196	0.38
India	3344	6.55
Myanmar	102	0.20
Sri lanka	11	0.02
U.A. Emirates	106	0.21
Total	51030	100

Supply Cycle in Pakistan

Province	Major producing Areas	Availability in Market
Punjab	Kasur, Sialkot, Narowal, Gujranwala, Mian Channu, Arifwala, Khanewal, Faisalabad, Jhang, Attock	March to April
Sindh	Tando Allah yar, Kunri	Feb to March
NWFP	Peshawar, Jehangirah, Bannu kohat and Kunri	April to December
Balochistan	Harnai	April to May

District wise Area and Production of Garlic in Punjab

Sr. No.	District	Area	Production	Area in Acres
				%age Share
1	Kasur	770	2414	10.5
2	Sialkot	785	2315	10.1
3	Narowal	600	2239	9.8
4	Gujranwala	551	1933	8.4
5	Khanewal	365	1580	6.9
6	Faisalabad	480	1523	6.6
7	Attock	356	1236	5.4
8	Jhang	332	1140	5.0
9	Multan	250	914	4.0
10	Sahiwal	239	839	3.7
Sub Total:		4728	16133	70.3
Other 24 Districts		2128	6800	29.7
Grand Total:		6856	22933	100.0

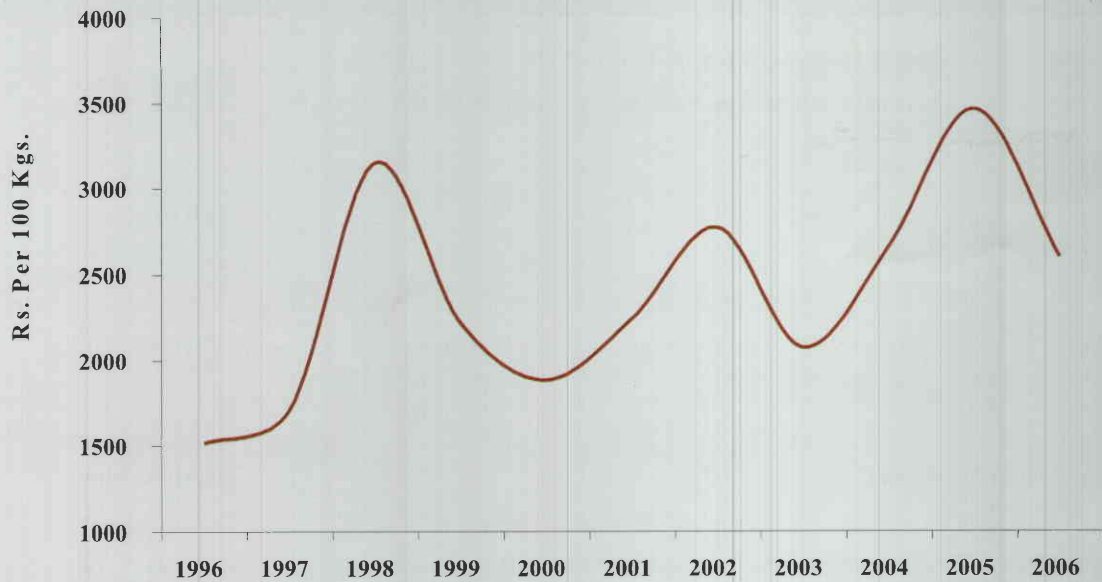
Source: Crop Reporting Service of Punjab.

Price Trends of Garlic

Long Term Price Trend

The long term price trend of garlic is increasing with sharp fluctuations in a cyclical fashion. There is a sharp rise in

prices after every 3 years, which is followed by correspondent sharp decline in the next year. The Long term trend of the average prices prevailed in all the major markets of Punjab are given as under:



Seasonal Price Trend of Garlic

Seasonal price trend/fluctuations have been worked out for main markets of Punjab for last 5 years. It is observed that prices are lowest during March to April when garlic crop of Sindh and Punjab arrives in the market. After these months supply comes from N.W.F.P and due to excess demand prices go on increasing. It shows that critical situation can be managed first by increasing the production of Punjab crop and secondly by enhancing the supply period from supply areas through introduction of early and late varieties.



Matrix of Garlic Problems and Possible Solutions

Sr. No.	Problem	Proposed Solution	By whom
1	Low and stagnating yield of garlic	<ul style="list-style-type: none"> • New high yielding varieties • Expansion of production period • Disease and pest resistant varieties need to be evolved • Improvement in farm management practices leading to better quality and more yields. 	<p>Research</p> <p>Extension</p>
2	Heavy price fluctuations	<ul style="list-style-type: none"> • Timely release of area and production estimation • Collection and dissemination of market information • Price forecasting 	<p>Crop Reporting service</p> <p>Agriculture marketing</p>
3	Lack of value addition	<ul style="list-style-type: none"> • Introduction of new advanced technique suitable for processing like dehydration, etc. • Introduction of new cultivars based on targeted local and international market 	<p>Food Technology</p> <p>Research</p>

USES OF GARLIC

Garlic is used in many forms from raw, cooked, and roasted to value added forms. Many are narrated below.

Garlic Greens

Fresh Garlic sprouts are chopped into small pieces and used in many foods.

Peeled Garlic

In this fast running life every one likes convenience. Thus fresh Garlic is peeled and then packed for easy handling and marketing. This can also be stored in refrigerator.



Flakes

Fresh slightly sun dried garlic cloves are crushed and minced. This product has more shelf life and easy to pack, handle and market due to less water content.



Garlic Paste

Fresh slightly sun dried garlic cloves are pressed for convenience in usage and avoid peeling. This paste has small shelf life at room temperature, but can be stored for few days in refrigerator. It provides complete range of flavor, texture and aroma when consumed fresh.



Garlic Powder

Garlic powder provides some of the flavor, but not the texture, of fresh garlic. It disperses well in liquids, so it's a good choice for marinades. One teaspoon garlic powder is good substitute for 8-10 fresh garlic cloves.



Granulated Garlic

Like garlic powder, granulated garlic provides the flavor, but not the texture, of fresh garlic. It disperses well in liquids. One teaspoon of granulated garlic is equal to 1/2 teaspoon garlic powder or 4-5 fresh garlic cloves.



Garlic Salt

It is the combination of 3 parts of table salt and 1 part garlic powder and provides convenience in use. It has more shelf life and thus can be handled, packed and distributed easily.



Garlic Juice

These are sold in spray bottles or in small jars. Look for them in the spice section of larger supermarkets. To make your own at home strain the juice from minced or pressed garlic and store in air tight jar.



Garlic Pickle

Whole cloves of fresh garlic are added to edible oil and table salt, turmeric, red chillies powder and cumin seeds are added to taste. After keeping it for few days, it becomes ready for utilization. It can be stored for longer periods when saved from moisture and contamination.





Infused Garlic Oil

Add whole cloves of garlic to olive oil and heat gently, and then discard cloves. Another way is to combine one cup vegetable oil and one teaspoon minced garlic. Use immediately or refrigerate and use within 24 hours.



Pills

Dietary supplements in pill form, as are commonly available, claim to possess the medicinal benefits of garlic, without "the unsocial qualities associated with fresh garlic cloves".

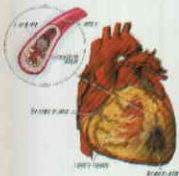


Health Benefits of Garlic

Now science is beginning to prove the medicinal properties of garlic that our ancestors took for granted. Studies have shown garlic can suppress the growth of tumors, and is a potent antioxidant good for cardiovascular health.

The conditions for which garlic is showing the most promise include:

Atherosclerosis



Studies suggest that fresh garlic and garlic supplements may prevent blood clots and destroy plaque. Blood clots and plaque block blood flow and contribute to the development of atherosclerosis. Blockage of blood flow to the heart, brain, and legs, can lead to heart attack, stroke, or peripheral vascular disease (PVD). People with PVD experience pain in the legs when they walk and move. If garlic does reduce the build up of plaque, then stroke, heart attacks, and PVD may be less likely to occur in people who eat garlic or take garlic supplements.

High Cholesterol



Long hailed for its beneficial effects, a number of studies have found that garlic reduces elevated total cholesterol levels more effectively than placebo. However, the extent to which garlic lowers cholesterol in these studies has been small.

Diabetes



Garlic has been used as a traditional dietary supplement for diabetes in Asia, Europe, and the Middle East. Preliminary studies in rabbits, rats, and limited numbers of people have demonstrated that garlic has some ability to lower blood sugars. One well-designed study conducted in Thailand, however, found that garlic was no better than placebo in lowering blood sugar levels in people with type 2 diabetes.

Common Cold

A well-designed study of nearly 150 people supports the value of garlic for preventing and treating the common





cold. In this study, people received either garlic supplements or placebo for 12 weeks during "cold season" (between the months of November and February). Those who received the garlic had significantly fewer colds than those who received placebo.

Cancer



Test tube and animal studies suggest that garlic may have some anti-cancer activity. Observational, population-based studies (which follow groups of people over time) suggest that people who have more raw or cooked garlic in their diet are less likely to have certain types of cancer, particularly colon and stomach cancers. Dietary garlic may also offer some protection against the development of breast, prostate, and laryngeal (throat) cancers.

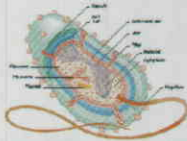
Tuberculosis

Numerous test tube studies have demonstrated that garlic extract inhibits the growth of different species of bacteria, including *Mycobacterium tuberculosis*, the organism responsible for tuberculosis.



However, very high concentrations of garlic extract were needed to slow down the growth of *M. tuberculosis* in these studies, so some experts are concerned that these levels may be toxic to people.

Intestinal Parasites



Laboratory studies suggest that large quantities of fresh, raw garlic may have antiparasitic properties against the roundworm, *Ascaris lumbricoides*, which is the most common type of intestinal parasite.

Ear Pain from Otitis Media



Most children with an ear infection known as otitis media experience pain. Often, ear drops with pain killers are prescribed to relieve this discomfort. A recent study compared this standard treatment to a combination herbal extract (also used as ear drops) containing garlic as well as calendula, St. John's wort, and mullein flower.



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