

# COMMERCIAL VEGETABLE PRODUCTION IN NEPAL

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## ABSTRACT

Vegetable sector can play a vital role in country's economy. During last four Five Year Plans, production of vegetables increased significantly with double the productivity, and area by almost three times. This effort was the contribution of government and non-government organization including various foreign aided projects. In next twenty year the production need to be increased by two and a half fold, which is possible with great efforts in research and extension to increase productivity; and with post harvest activities and efficiency in marketing systems to increase per-capita consumption.

## INTRODUCTION

Vegetable cultivation in Nepal can be traced back to antiquity. At present, it occupies an important position in the traditional farming system operating on a self-reliance basis. In fact, the whole agriculture sector is a foundation of country's economy, and contributes significant role in raising the standard of living of the Nepalese people. Although food production is an important aspect of food security, it is equally important too to enable people's capacity to buy the food items needed for them. This in turn, demands a growth in income generating activities and employment opportunities. Therefore, Vegetable sector is an important productive one of our economy. The diverse agro-ecological condition and the high yield potentiality of vegetable in terms of nutritional value might have led to a great extent in the increase of area, production and consumption by the local people. So there is a need of diversification and commercialization of vegetable farming system to raise income and employment opportunities to the farmers by identifying high value crops as vegetables. The availability of large number of vegetable varieties of which 50 species are commercially grown and potential to produce off-season crops, have provided opportunities to expand vegetable cultivation both for domestic use and export. Vegetable cultivation has now reached a good deal of specialization around highways, urban and sub-urban areas, and special pocket areas for special crops. In Nepal, vegetable has become an indispensable food item in the regular diet but production and consumption of better food quality remains yet to gain sufficient momentum. The future prospect of vegetable commercialization is really bright. Hence, it can make the headway, gearing up the vegetable development by sound technical back stopping and congenial infrastructure and institutional situations.

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## **REVIEW**

Historical background :- Vegetable is being cultivated in Nepal from the time immemorial. Except for a few indigenous crops, majority of these vegetable varieties have been introduced since the Christian Era (Chatterjee S.S., 1986). Although in public sector, collection and evaluation work was first started in 1940, it is only during the last decades that planned vegetable development has been initiated in Nepal. Varietal development scheme was started during 1960s as the seeds of these crops were imported from abroad.

Furthermore, many vegetable varieties were received from India, USA, Japan and other International Institutions such as AVRDC, Taiwan etc. After the advent of Vegetable Development Division (VDD) in 1972, Fresh Vegetable and Vegetable seed Production Project, financed by the Swiss Funded FAO in 1981, Vegetable production program was started in planned way in commercial scale.

Review of Vegetable Varieties and Species :- Owing to diverse agro-climatic zones and a large number of introductions, Nepal is rich in both indigenous and exotic vegetable species. Some of the reports, which are sporadic in nature, are presented below.

Kurtia (1969) describes that there are 104 species of vegetables belonging to 19 families, which are grown in Nepal. P.P. Regmi (1984-85) has also reported the cultivated and wild species of vegetables that are available in Nepal, based on different morphological parts utilized as vegetables. According to him, there exist 119 cultivated and 52 wild species of vegetables.

According to Aryal (1994) there are more than 200 varieties indigenous of which 50 are in commercial cultivation. He also pointed out that there are more than 50 species of vegetable recognized as potential materials which are known to exist in Nepal but not exploited for their use of the enormous plant species available in Nepal, some of them have been exploited while others are not even cared for domestication (Devkota 1990)

Area and Consumption :- In Nepal, though the area and consumption are somewhat better, the level of vegetable yield is lower than desired (Chatterjee, S.S. 1986). He also mentioned that the present rate of vegetable consumption 45 Kg. Per annum was hardly fifty percent of the minimum requirement as laid-down by the dietitians and nutritionists.

## **PRESENT STATUS**

Vegetable Varieties :- Among the vegetables of Nepalese origin viz.; Cucumber and Radish are grown all over the country. Similarly, there are many indigenous germ-plasm under commercial cultivation (Annex - 1).

Different agencies working in Nepal have introduced different types of vegetable seeds For example Japanese Overseas Volunteers have popularized Mino Early Radish in Daman, Palung and Kakani areas. Similarly, Vegetable Development Division, Fresh

Vegetable and Seed production Project, FAO have introduced many exotic vegetable seeds from India and abroad ( Annex – 2 ).

There are several under utilized vegetables viz.; Cress, Broad bean, Watermelon, Turnip etc and under exploited vegetables such as Wild Asparagus, Ferns, Wild Mushrooms and many other which can be explored commercially. There are more than 50 species unexploited recognized as wild species which can be used as a genetic source for the improvement of commercial cultivator to particular desirable traits such as resistance to diseases, insect, environmental stress and earliness etc.

**Table – 1. projected growth for twenty years of vegetable area (in hector)**

S.N.	Vegetable	1994/95	2014/15
1.	Main Season	112000	296000
2.	Off Season	46100	121200
	Total	158100	417200

Source (APP, 1993/94)

The Agriculture Perspective Plan (APP) has given priority to the production of off-season vegetables in hills and mountains.

**Table: 2 Area, Production and Productivity of vegetables (1980/81) to (1996/97)**

S.N.	Year	Area (ha)	Production (Mt.)	Productivity (Mt/ha)
1.	1980/81	104006	521336	5.00
2.	1981/82	118172	565049	5.28
3.	1989/90	140500	967167	6.88
4.	1994/95	140500	1211500	8.62
5.	1995/96	140500	1253940	8.92
6.	1996/97	146500	1357453	9.27

During the past six years, area under vegetable cultivation has not increased but as compared to 15 years data area, production and productivity have increased by 38, 92 and 60% respectively. Per capita availability of vegetables for consumption is also increased by 42 percent.

**Hybrids (F1) :-** In vegetable crops, the total yield or productivity is often considered less important than the marketable yield. The economic yield is largely determined by the earliness, uniformity and quality of product. In this context, use of hybrid varieties is becoming more popular and so they are in increasing trend. In Nepal about 25% of vegetable area is covered by the hybrids.

The quality in hybrids for commercial production includes higher yields, uniformity in size, shape, and weight and more over they are most suitable for the adverse climatic situation, such as tolerant to heat and cold, resistant to certain disease and pests.

Therefore, they are most suitable for off-season production. In Nepal, the main vegetable crops and hybrids used is presented in ( Annex – 3 ).

**Off-season Production** :- The vegetable growers in Nepal could be able to produce off-season vegetable by the use of very early late cultivars of vegetable crops like Cauliflower, Cabbage and Radish. They are also raising seedlings under plastic tunnels to get early market, specially that of Cucumber. Availability of hybrids varieties in different agro-climatic condition have also provided opportunity for off-season cultivation.

**Technology Generation** :- Vegetable research received some attention when VDD was created in 1972 under Department of Agriculture (DOA). In 1981 a vegetable seed production project, FAO, VDD with the strong support form the project conducted studies for the evaluation of indigenous and exotic species. Most of the vegetable research and technology generation activities were undertaken and coordinated by VDD in six vegetable farms viz.; Dhankuta, Sarlahi, Khumaltar, Marpha, Rukum and Dadeldhura including Lumle Agriculture Research Centre and Pakhribas Agriculture Research Centre.

Presently, National Agriculture Research Council is mandated to conduct research for Horticulture Development, including vegetable crops. However, most of the infrastructure and manpower developed for vegetable research in the past remained with DOA.

The research activities as conducted by VDD/ FAO led to the adaptation of varieties for different regions and season, date of planting cultural practices, nutritional requirement and control of pest and diseases. Different crop varieties were well established. Studies also resulted to develop off-season production technology in different agro-climatic zones. Techniques were also developed for off-season nursery growing under cover cultivation and use of plastic tunnels in off-season vegetable production.

## **APPROACH**

Vegetable production is an important and productive sector in Agriculture. In order to achieve the objectives of 8<sup>th</sup> Plan, priorities were given in crop diversification, employment generation, develop industrial activities, export promotion etc, Vegetables Development sector could play a vital role in such activities. In view of these potential activities in the country, the government made various approaches / strategies to boost-up production of fresh vegetables, and to meet the deficit nutritional requirement of the people.

The following approaches are taken to boost-up vegetable production during the plan periods:

- Assessment of nutritional requirement and supplement based on vegetable as a source.
- Based on the nutritional requirement and population growth, production plan has been formulated to district level on potentiality of districts, crops and dissemination of already developed technology.
- A guideline has been developed for implementation of vegetable production programs at district level.

- Based on agro-ecological /climatic situation, crops/ varieties and production packages are developed.
- Intensification of potential production pockets such as peri-urban areas, corridors of national highways and feeder roads, special micro-climate pocket areas.
- Develop resource service centers such as establishing private nurseries to distribute improved seeds and necessary inputs (fertilizers, chemicals etc.) with technical packages.
- Identify special pocket area/ district for special crops (*Parwal*, Tomato, Radish, etc) which can later be developed for export markets.
- Develop human resources or skilled manpower to disseminate improved technology through training farm visits, demonstrations and mass communication media.
- Strengthening managerial capacity of horticultural farms and centers as a source of technology dissemination.
- Commercial production programs were launched mainly in the areas, which have developed infrastructures such as irrigation, transport and market facilities.
- Such intensive programs were implemented through the farmers group in the selected areas.
- General program would also be implemented to encourage home gardening and local markets to meet the nutritional requirement specially for remote people.
- Efforts in exploring new potential pockets for expanding area and increasing productivity through improved technology for vegetable production is emphasized in every plans and programs of GOs, INGOs, NGOs. Public and private sectors.
- Policies on building infrastructures such as cold storage, marketing channels, post-harvest activities etc, have been formulated for future plan periods to implement.

### ***DEVELOPMENT / PRODUCTION***

Since early 1970s, vegetable production has received due attention by establishing Vegetable Development Division in 1972 in full fledge, for the development of vegetable research, production and extension activities with the following mandate:

- Prepare plan, policy, guidelines and coordinate with other organizations to formulate and implement vegetable production program in the country.
- Collect and maintain germ-plasm, of vegetable crops for evaluation and crop improvement program.
- Maintain and produce nucleus and foundation seeds of promising and released varieties in the horticulture farms and centers.
- Extend technical guidelines to farms and centers in generating improved technology and disseminate to vegetable growers.

- Manage technical resource persons to provide training and demonstration through extension agents.
- Develop technical manpower through national and international training, visits, seminar etc.
- Develop and support public and private sectors in developing a sound vegetable seed industry to meet domestic requirements and for the potential exports.
- Coordinate with various organizations in research and development activities of vegetable crops.

With the above objectives and mandates, Vegetable Development Division has succeeded in releasing 35 varieties and identified many more promising varieties for commercial cultivation. There are 24 horticulture farms / centers (15 under DOA and 9 under NARC) identified for variety maintenance and production of nucleus and foundation seeds. At present about 12 metric tons of source seeds are produced in these farms annually. These seeds are used as source seeds for producing about 400 metric tons of improved seeds for growing commercial vegetable in the country and some seeds are exported to neighboring countries by private sectors.

At present situation, estimated seed requirement of improved seed is about 1200 metric tons to cover 1,46,500 hectare of vegetable areas. The production of vegetables from this area at the end of 8<sup>th</sup> plan 1996/97 is estimated around 13,63,000 Mt. By the end of 9<sup>th</sup> plan we may require more than 1400 metric tons of improved seeds. This shows that our production capacity is far below the requirement, and need to focus on this issue seriously.

With the change in organizational setups the mandate of conducting research activities lies with NARC, whereas most of the developmental activities such as production of basic / source seeds, maintenance of released and promising varieties are still with DOA.

Adjustment of mandate and responsibilities is still unsolved. This situation is becoming a major setback in research and development activities.

Similarly, the present vegetable production trends and rate of increase in production cannot maneuver with the increasing growth rate of population to support nutritional requirement.

To overcome this problem, increase in production by extending areas is a limiting factor unless we increase in the productivity.

To increase productivity many efforts are needed in developing improved technology. A production program has been projected in the coming five year plans to match the population growth and per capita consumption. Annex - 4.

Since the end of the 8<sup>th</sup> plan the government has already given thrust to increase productivity by increasing cropping intensity and crop diversification. The guidelines are given in the district program planning for increasing vegetable production.

The guidelines includes production of fresh vegetables in the kitchen gardens, specially in the remote area where vegetables are hardly cultivated for consumption due to lack of nutritional awareness and production skills and planning vegetable production programming by the corridors of national highways and linked roads. Special pocket areas are to be identified for special crops with the introduction of high value crops for export markets. Crop diversification is another effective strategy by developing basic

infrastructures and improved cropping pattern to replace traditional cropping systems itself. The increase in cropping intensity alone can increase the production remaining the area as same.

## **RESEARCH**

The food situation in many developing countries is becoming a serious problem, specially in country like ours where more than 90 percent people are engaged in agro-based occupation, and agriculture system is not fully developed yet. Erratic climatic situation always brings problems in food production as it happened this year too. To avoid such situation a research programs may play a vital role in developing new technology in agriculture. Apart from this adverse situation, research program should initiate exploring potential genetic resources to develop as commercial crops/varieties. The world knows our country is rich in plant genetic resources, and sometimes it seems scientists from abroad take advantages of these genetic materials, but we always depend on their developed cultivars. The recent trend of vegetable seed supply shows the tendency of importing vegetable seeds of hybrids as well as open pollinated crops from abroad where it is obvious that the potentiality of producing all kinds of vegetable seeds in the country is possible.

Leading to productivity increase:- As it is mentioned earlier to increase production and productivity new strategy has been taken in vegetable production extensively as well as intensively, by increasing intensity of cropping pattern and exploring more potential areas. However, the major role has to be played by research activities to increase productivity.

During the 9<sup>th</sup> plan, the emphasis has been given for high value crops such as vegetables and vegetable seeds, but in the newly launched foreign aided projects, vegetable sector has been given low priority. No doubt, there are identified institutions, organizations, not only in government sector but also in semi-government and private sectors, with research and development mandate for vegetable development, and their contribution is significant.

Many projects under FAO, ODA, SDC, USAID, GTZ and many others have launched several programs in research, development, developing human resources, creating necessary infrastructures, but their sustainability is a challenging task.

The major constraints in set back of research and development activities in vegetable sector is lack of management and organizational setups.

Nevertheless, newly launched project AREP/ World Bank will give thrust to research activities through NARC and other public sectors.

Introduction of new species and varieties: With the above objectives and mandate, in the past 20 years, Vegetable Development Division has succeeded in releasing 35 varieties of 22 different vegetable crops, and identified many more promising varieties for further release through Variety Release Committee of National Seed Board, for general cultivation. This tremendous achievements was the efforts of horticulture farms and centers with technical assistance of Swiss funded FAO project. Even now, there are 24 horticulture farms/centers (15 under DOA and 9 under NARC) identified and responsible for germ-plasm collection, variety maintenance and production of nucleus and foundation seeds and conduct research/ verification trials on vegetable crops. These farms/centers are also engaged in collecting commercially important and valuable crops as indigenous materials, such as Colocasia, Yam, Garlic, Chayote,

Amaranthus, Turmeric, Blackpepper, Cardamom etc. At present 12 metric tons of source seeds improved and released varieties of vegetable crops are produced annually in these farms.

In recent advancement South Asian Vegetable Research Network (SAVERNET) commenced several research programs through the establishment and operation of a coordinated research and training network in SAARC countries. The project is funded by ADB and coordinated by Asian Vegetable Research and Development Center, (AVRDC) Taiwan. Looking back, the SAARC countries have immensely benefited from the research network under SAVERNET through the following:

1. Exchange and evaluation of elite varieties to assemble, multiply, maintain, distribute for further development.
2. Crop and pest Management Research
3. To develop and test technology packages for adoption by farmers in their fields.
4. Translating Research into farmers application.

Post harvest technology :- Vegetables being a perishable commodity both qualitative and quantitative losses is occurred right from the production point to the consumers kitchen. More over due to lack of consciousness about the quality of the product, consumers improvement over quality deterioration is rarely attempted. For this there is a felt need of development of post-harvest technology in this field to improve present situation.

Commercial vegetable production and marketing activities are broadly confined to private sector. There is limited basic infrastructure for post harvest activities.

The government has made a policy from 9<sup>th</sup> plan to create such an environment that private sector may come in this field in creating the infrastructure. It is reported that 20-30 percent losses occurs in vegetable items in our context. Therefore, if these losses are shave , production will be increased naturally.

### **MANPOWER**

There is an acute shortage of trained manpower in vegetable sector. The human resource developed by the government through various projects were not utilized efficiently due to frequent change in organizational and administrative policies. Shortage of trained personnels, specially at central organization impedes development activities.

During FAO project period from 1981-1996, long term and short term training, higher studies, study tours, were given to all levels from National Directors to farmers, including private seed entrepreneurs, in order to accelerate vegetable development activities in the country. Annual workshops and seminars were conducted to discuss annual programs and development in the farms and district levels, but such activities could not continue after the termination of the project. The government strategy was to sustain or continue the development activities even after the termination of the project. The constraint is lack in implementation of the recommendations given by several workshops and seminars. The only potential organization to sustain and continue this activities is through Central Agriculture Training Centre (CATC)/DOA.



## **INPUTS**

Broadly specking, inputs cover from land, capital, manpower, management etc, however only direct inputs such as, seeds, fertilizers, chemicals, loan rate and its disbursement system and irrigation are discussed in this paper. As we know extensive cultivation system is becoming a limiting factor, due to increase in growth of urbanization, industrialization and fragmentation in landownership. This situation guides us to go for intensive cultivation practices . For this, there should be optimum use of inputs required for the plants, which are basic need of the crops. Among these inputs many of them are again limiting factors, such as fertilizers, sufficient and reliable seeds of improved varieties, limited irrigation facilities, and availability of technical skills of vegetable production. In the context of using hybrid seeds, of course it has tremendous yield potentiality, provided it is supplied with optimum inputs. At the moment, seeds of improved variety is insufficient, which we could supply if planned properly. Increase in importation of hybrid seeds encounters the domestic seeds industry, which is the most viable agro-industry in the country. Our farmers are not able to use hybrid due to lack of technical information / skills . It doesn't mean that hybrid is not completely needed, but it may require in small and specialized pocket area only. Use of chemical fertilizers is in more demand, but the supply is limited and price is hiking day by day. Similarly cost of other inputs as labor, irrigation are also increasing in the same proportion, which results in increasing cost of production

## **MARKETING**

Marketing is a complex mechanism or system in agricultural development. Efficient marketing mechanism activates farmers to increase the production by rewarding profitable price. Marketing organization as well as consumers also get profited by this mechanism . Nepal holds small farms in majority, which require development of market oriented production in more efficient manner. The present production and marketing system of fresh vegetables is not matching each other, due to which there is always a market glut and scarcity from season to seasons. A systematic market chain / channels are to be developed to balance the production and consumption of the produce. Studies on marketing systems on agricultural commodity is conducted from time to time. During the FAO project period several surveys have been conducted with Marketing Development Division(MDD). These surveys and studies provided a clear picture of marketing channels, bottlenecks and means of improving them .To implement those studies, MDD and Small Market Infrastructure projects (SMIP) are working together to create basic infrastructures in the country. The SMIP is establishing Kalimati Wholesale Market in Kathmandu and collection centers, small vegetable markets and wholesale markets at potential area of Tarai district (at Dhalkebar, Janakpur, Bardibas, Lalbandi, Nawalpur, Narayangad, Pokhara ) . After completion of these vegetable markets and wholesale markets there will be some outlets for the vegetable production in those area. In Nepal production can be scheduled to take advantage of diverse climatic situations which makes possible to produce wide range of vegetables and supply even during off seasons for distance markets.

Basically there are three distinct marketing systems in the country:

1. Producer sell their own produce through different marketing systems by themselves to the consumers.

2. Producers sell the retailers directly and from retailers to the consumers.
3. Producers sell their produce to whole seller/middleman and from wholesaler to retailer and to the consumer.

However these system depends on the quantity of the produce and distance of production area . If the production area is close to the market, the producers sell their produce directly to the consumer.

The government production planner / decision makers should consider the following prerequisites in developing a production program in a specific pocket areas or regions:

1. Developing production technology.
  2. Developing collection centers / vegetable market centers / wholesale markets.
3. Developing post-harvest technology .
4. Providing ware houses /multi chambered cold storage for vegetables.

Similarly producers should also consider the following points before switch on the business:

1. Must record cost of production and decide profitable market price.
2. Find out market information.
3. Grow only vegetable items demanded by market price and volume.
4. Produce only off season crops to supply during lean period .

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**Annex-1. Selected indigenous germplasm , which are now cultivated in different parts of Nepal.**

S.N.	Crop	Variety	Status
1.	Cauliflower	Kathmandu	Released
		K-5	Pipeline
2.	Radish	Pyuthane Red	Released
3.	Turnip	Kathmandu Red	Pipeline
4.	Garlic	Kathmandu Selection	Recommended
5.	Asparagus been	Khumal Tane	Released
		Sarlahai Tane	Kathmandu Red
6.	Egg plant	Sarlahi Green	Recommended
		Nurki	Released
		Pokhara Selection	Recommended
7.	Chili	Kathmandu Selection	Recommended
8.	Cucumber	Bhaktapur Selection	Recommended
		Kusle	Released
9	Sponge guard	Kantipure	Released
10.	B.L.Mustard	Khumal Broad Leaf	Released
		Marpha Broad Leaf	Released
		Khumal Rato Pat	Released

**Annex 2: The status of exotic cultivars , which are developed for communication cultivation**

S.N.	Crop	Variety	Status
1.	Cauliflower	Dolpa Snow ball	Released
		Sarlahi Deepali	Released
		Kibo Giant	Pipeline
2.	Cabbage	Copenhagen Market	Released
		Pride of India	Pipeline
3.	Radish	Mino Early	Released
		White Neck	Released
		40Days	Released
		Tokinashi	Pipeline
4.	Peas	Sikkime	Released
		Sarlahi Arkel	Released
		New Line	Released
5.	Onion	Red Creole	Released
		Agrifound Dark Red	Pipeline
		Agrifound Light Red	Pipeline
6.	Spinach	Haripat	Released
7	Swisschard	Susaag	Released
8.	Tomato	Monprecos	Released
		Roma	Released
		NCL-I	Released
		Pusa Ruby	Released
9.	Brinjal	Pusa Kranti	Pipeline
10.	Chili	Jwala	Released
		Suryamukhi	Pipeline
11.	Sweet Pepper	Californiawonder	Released
12.	Okra	Parvati	Released
13.	Pole Bean	Trishuli Ghiu Simi	Released
14.	Bush Bean	Jhange Simi	Released
15	Cucumber	Green Long	Pipeline
		Point Set	Pipeline
16.	Squash	Asare Squash	Released
17.	Bitter Gourd	Hariyo Karela	Released
		Coimbotore Long	Pipeline
18.	Sponge Gourd	Pusa Chikni	Pipeline
19.	Carrot	Nantes	Released
		New Kuroda	Pipeline
20.	Turnip	Purple Top	Released
21.	Bottle Gourd	Pusa Summer Long	Pipeline
22.	Fenugreek	Kasuri	Pipeline
23	Watermelon	Sugarbaby	Pipeline

### Annex-3. Imported Hybrid Varieties

S.N.	Crop	Variety	Source
1.	Cabbage	Green Coronet, K.K.Cross	Japan
		Green Cross, K.Y.Cross	Japan
		Green Cream, Green Stone	Japan
		Green Challenger.	Korea
		Gloria, Ratan, Kranti, Ganga	India
2.	Chinese Cabbage	Asveg 1	Japan
		Tropical Emperor	Japan
3.	Cauliflower	Snow King, Snow Cream	Japan
		Snow Queen	Japan
		Rami	Denmark
4.	Broccoli	Premiun Cross	Japan
5.	Tomato	Rupali, Vaisali, Navin	India
		NTS-64	Holland
6.	brinjal	Long-13, Round-14, Sukhel	India
7.	Cucumber	Priya	India
8.	Zucchini	Balanouse, Wenhang	Korea
9.	Watermelon	Madhu, Milan	India
10.	Capsicum	Sweet Banana	India

### Annex-4. Projection of Vegetable Production in Nepal

Plan Period	Area (Lakh)	Productivity (mt/ha)	Production (Lakh)	% Change	Consumption (Kg/capita/year)
8th	1.46	9.3	13.57	40	51
9th	1.66	10.7	16.93	25	60
10 <sup>th</sup>	2.20	10.5	23.10	38	70
11 <sup>th</sup>	2.62	11.0	28.82	25	80
12th	2.92s	11.5	33.58	17	90