

NARDF Technical Paper Series Report

Promotion of Off-season onion production for import substitution (FPP-419)

Abstract

Onion (Allium cepa L) is consumed as vegetable and spice in Nepal. Domestic meet s less than 10% of the total demand. A study of Kalimati Fruit and Vegetable Market Development Committee (2003) showed that there is a transaction of more than 8,911 tons of dry onion in Kathmandu valley alone. Approximately 94% of the total transaction comes from India. The ideal temperature for bulb formation is 13^o to 24^o C. This range of temperature is available in Nepal both in autumn and spring season. Utilizing the climatic advantage. From different studies and experiments mid hills, low hills and Terai of Nepal has suitable temperature for bulb formation of onion (13^o to 24^o C) prevails during latter part of rainy season to the beginning of winter season (August to November). Utilizing this period in well-drained Bari land and upland off-season/Kharif season onion can be produced. With this background and comparative advantage, off-season onion production study was undertaken in some of the selected VDCs of Nuwakot, Rasuwa and Dhading.

The study concluded that off-season onion can successfully be produced in all three ecological belts with little differential time of planting. At high hills (above 1500 meter) seedling or set transplanting between Shraavan 15 -30 has given the best performance. For mid-hill between 600 to 1500 meter Shraavan 15 to Bhadra 5 and low hills up to Bhadra 10 gives better bulb yield. Transplanting after Bhadra 15, none of the varieties at any altitude could form bulb as it can not meet the temperature requirement of above 13 degree Celsius to 24 degree Celsius required for bulb formation. The overall performance showed that set planting was better than seedling planting. However there was no significant difference in yield between seedling and sets for bulb production. The yield range varied from 868 kg to 1443 kg per Ropani. Two varieties Agrifound Dark Red and N-53 are suitable for off-season onion production. Either seedling or set can be used depending on farmer's choice.

Keyword

Off-season, Agro-climate, Comparative-advantage, Market-linkage, Dissemination, Scaling-up, lean-period, splitting, bolting

1. Introduction

Among the bulb crops, onion and garlic are the most important vegetable crops grown in Nepal. Onion (Allium cepa L) is one of the most important vegetable and spice crops of Nepal. It can be cultivated from Terai to high hills. The ideal temperature for bulb formation is 13^o to 25^o C. This range of temperature is available in Nepal both in autumn and spring season. The normal practice of onion bulb production in Nepal is seedling transplanting during late autumn to winter and bulb harvesting from April to May. During this period price of onion goes as low as Rs 5/kg. Due to poor storage facilities summer-harvested onion has very short marketing period from May to July. Afterwards onion gets sprouted during rainy season and is quickly finished in the market. From July/ August onward onion import from India starts and price goes as high as Rs15-18/kg and continue to remain high price till the winter planted onion is harvested again during Next April/May. Thus from August onward till to March end market is supplied with Indian onion produced in Kharif season in southern states of India. From different studies and experiments (see review in section C) mid hills, low hills and Terai (where there is no water logging) of Nepal has suitable temperature for bulb formation of onion (13^o to 25^o C) prevails during latter part of rainy season to the beginning of winter season (August to November). Utilizing this period in well-drained Bari land and upland off-season/Kharif season onion can be produced economically in commercial scale. With this background and comparative advantage of rain-fed onion production possibility the present developmental activities have been proposed. Onion is very important vegetable as well as spice crop of Nepal. Demand for onion is rising in market but domestic production scale is very small due to which most of the onion sold in Nepali market is coming either from India or China. The normal practice of onion bulb production in Nepal is seedling transplantation in late autumn to winter and

bulb harvesting from May to April. Due to poor storage facility and sprouting problem summer harvested onion from Nepal has very short marketing period from May to July. From July/August onwards onion import from India starts until winter planted onion is again harvested in next April/May. Moreover price of onion during April/May goes as low as Rs.20/Kg and from July/August onward when Nepali onion finishes, Indian onion comes into Nepali market and price goes as high as Rs.40-60/Kg up to Rs.80 during September/October (Dashai and Tihar time).

Off-season onion gives three to four times higher income from the same piece of land compared to foregone crop like millet as off-season onion replaces millet after maize in most cases. After onion harvest, wheat or oil-seed mustard or other vegetables can also fit in the rotation. Autumn harvested onion fetches better price. The post-harvest losses is minimum during autumn and winter due to reducing temperature. As no irrigation is required and residual moisture is sufficient the cost of production is reduced. Onion production during off-season provides higher economic return. Thus off-season onion contributes to sustained poverty reduction. **Therefore this project was designed and research activities and development activities were implemented with the financial support of National Agricultural Research and Development Fund (NARDF) to address the production and market linkage development of off-season onion. The project aimed to achieve the following objectives:**

1. To demonstrate off-season onion production during late rainy season through autumn from seedling and onion set transplanting during August.
2. To demonstrate onion storage structures for regular supply in the market. To support farmers and traders to improve post harvest handling of onion
3. To support in establishing market linkage, and
4. To disseminate project findings for wider adoption in the region to contribute to poverty reduction.

2. Literature Review

Onion has got a Sanskrit equivalent '*Palandu*' mentioned in *Apastamba Dharma sutra -1* (dated 800 B.C to 300 B.C) which signifies its very early introduction in Indian subcontinent. Jones and Mana (1963) gave an account of origin, documentation and distribution of onion. Onion had been domesticated independently in several places. It occupies a large area in Western Asia, extending from Palestine to India and Nepal. Bajaj et al (1980) studied the chemical composition of bulbs of 12 onion cultivars and observed that the dry matter varied from 10.66 to 14.80 percent, TSS 41.5 to 74.0 percent, reducing sugar 12 to 22.25 percent and phenol 1.75 to 2.95 percent on dry matter basis. The pungency in onion odour is formed by enzymatic reaction only when tissues are damaged. The pungency is due to volatile oil known as *allyl-propyl disulphate*. The onion must have been grown in Indian sub-continent including Nepal from very ancient times, as it is mentioned in Charak Sanhita a famous ancient literature.

Onion is a mild climate crop. Very high and very low temperature is unfavorable for onion. Onion seed germinates even at 3 °C, however good germination requires soil temperature above 10 °C. Good vegetative growth takes place between 13-25 °C and best quality bulb production takes place between 13°-24° C temperature and bulb maturity between 25-30 °C. Onion is long day plant and day length varies with varieties. Most of the onion varieties grown in Nepal, initiate bulb formation when day length is more than 11 hours. However bulb formation is affected by many factors like temperature, day length, nutrition, light quality, light intensity and growth substances. Adjusting the time and techniques and varieties onion can be grown in Nepal from Terai to high hills and in different season of the year. However, it is winter planted crop in general. Off-season onion production from set requires set production first sowing seeds during Paush end to Magh beginning (January) and harvesting sets during Baishak - Jestha (May) and storing at cool and well ventilated place up to Shraavan. Then transplant set during second fortnight of Shraavan to first fortnight of Bhadra (August). The set size should be 1-1.5 cm in diameter weighing around 10 gm. larger set sizes more than 2 cm diameter will produce splitted bulbs. Sets from early sown seeds and larger bulbs may also bolt instead of producing quality bulbs. These off-season onions is planted after maize or relayed with maize and harvested during Kartik-Mangsir.

The normal practice of onion bulb production in Nepal is seedling transplanting during late autumn to winter and bulb harvesting from April to May. During this period price of onion goes as low as Rs 5-10/kg. Due to poor storage facilities summer-harvested onion has very short marketing period from May to July. Afterwards onion gets sprouted during rainy season and is quickly finished in the market. From July/August onward onion import from India starts and price goes as high as Rs15-30/kg and continue to remain high price till the winter planted onion is harvested again during Next April/May. Thus from August onward till to March end market is supplied with Indian onion produced in Kharif season in southern states of India. From different studies and experiments, mid hills, low hills and inner Terai of Nepal has suitable temperature for bulb formation of onion (13° to 25° C) prevails during latter part of rainy season to the beginning of winter season (August to November). Utilizing this period in well-drained Bari land and upland off-season/Kharif season onion can be produced economically.

In view of the high price and production potential, onion bulb production from sets during September-November was tried since 1986. Chatterjee (1988) reported that 1 cm diameter size sets gave better yield of single bulb while larger sets produced spited bulbs. He further reported that seedlings produced under plastic tunnel during rainy season and planted during mid August gave equally good size bulb yield during November under Sarlahi condition. The studies on bulb production from sets were repeated during 1989/90 in khumaltar, Dhankuta Sarlahi, Rukum and Lumle (Pandey and Thapa 1990). Budhathoki 1990 also reported that set of N-53 planted during August gave satisfactory bulb yield in Lumle. Pandey and Thapa 1990 reported among three varieties N-53, Agrifound Dark Red and Red Creole when planted with the set size of 1-1.5 cm on August 15; Variety Agri-found Dark Red gave 16.4-mt/ha yields with attractive bulb size. Kaini in Dhankuta reported similar results. During 1990/91 Thapa and Pandey reported that Agrifound Dark Red and Agri-found Light Red planted during first fortnight of August with 1-1.5 cm set size gave 15.5 mt /ha marketable bulb yield.

The normal techniques include the production of set onion sowing seeds of recommended varieties (Agri-found Dark Red, Agri-found Light Red and Nasik -53) during February. Harvesting sets during May/June and storing in airy place up to July and planting as relay crop in maize field or after harvesting early maize. Some researchers have also tried recently growing seedlings under protection during July and transplanting during August. However, though the technology is already established by research and is profitable as well, the demonstration, promotion and commercialisation remained weak. Hence, there is a need to demonstrate the technology in farmer's field in participatory way and promote off-season onion production and develop market linkage to substitute the import and help the farmers to raise their income.

Agri-found Dark Red and N-53 was reported as better varieties for off-season production by Bhattarai and Subedi (1994). New Kharif varieties developed in India such as N2-4-1, ArkaKalyan, Arka Niketan, and Baswant 780 are in addition to the varieties, N-53, Nasik Red, Agri-found Dark Red, Agr-found Light Red, and Red Creole. The existence of local land races having excellent performance in farmer managed condition in terms of yield and quality as compared to commercial varieties have been reported (Budhathoki and Sharma, 1994). These include Nuwakote Local, Dailekh Local, Mallaj Local Surkhet Local and Baitadi Local etc. By Rokaya and Bhandari (2004). The performance evaluation of these local materials and further expansion is also urgently needed to reduce the dependency on imported high priced onion.

Recent studies conducted in Rupandehi (DADO Rupandehi, 2005) and Citrus Farm Palpa (GP Pandey 2005) also reported that Agri-found Dark Red is suitable for off-season bulb production both from seedling and sets. Further demonstration and studies with different dates of planting for autumn harvest to substitute import has been highly demanded.

3. Materials and methods (conceptual framework, data, model, methodology)¹ ?

The project activities have been divided into i) action research and ii) extension/development activities. The action research activities included production trial and promotional production demonstration at different altitudes. In each eco-belt (low hill, mid hill and high hill) 5 farmers were identified as lead farmers from group meeting and thus there were 15 lead farmers. Based on the agro-climatic condition and interest of the farmers. Six onion varieties; 1) Agrifound Dark Red 2) N -53 3) Red Creole 4) Bemausami 1and 5)Baitadi Local were included in the study. Each lead farmer was provided with seed and other inputs for at least two varieties with three dates of planting at 15 days interval to find out suitable time of planting/transplanting as the case may be. The plot size for testing was maintained with 5 square meters per variety. Demonstration plots were maintained 10 square meter size. Different agronomic and horticultural practices and plant protection and soil management with safety measures were applied in these trial plots and demonstration plots With the help of Field Technician and Social Mobilizer these lead farmers conducted study trial and recorded the following information.

1. Dates of sowing/transplanting
2. Dates of intercultural operations
3. Days to harvest from transplanting
4. Yield per plot

The general farmers were also provided with seed and training to produce seedlings, sets and off-season bulb. Techniques were transferred to the general farmers through practical trainings and field visits. During second year the same experiments were repeated and demonstration production were conducted for promising two varieties Agrifound Dark Red and N-53.

Participatory tailored trainings on skill development for production, post-harvest management were provided. Developmental activities undertaken included collection of market information, construction of storage structure, haring results and lessons learnt for wider dissemination through field days, exposure visits, workshops and publication of findings on participatory way. In each activity the methods and materials required were decided by group meetings and discussions.

4. Results

Result 1: Appropriate planting time and techniques for off-season onion production in low hills and mid hills demonstrated.

Farmers groups formed at different sites representing low hill (<600 meter), mid hill (600-1500 meter) and high hills (above 1500 meter). In each site, adaptive field trials were conducted to identify suitable planting time, onion variety and planting materials (set and seedling) for off-season (June to November) production targeting lean season market. The suitable varieties, planting dates and planting materials identified are presented in table below:

Table 1: Identified onion varieties, planting dates and planting materials for different altitudes

Sites	Varieties	Planting dates	Planting materials
High hill above 1500 meter	Agri-found Dark Red and N-53,	Shravan 15 - 30	Both seedling and sets
Mid-hill 600-1500 meter	Agri-found Dark Red and N-53,	Shravan 15-Bhadra 5	Both seedling and sets
Low-hill <600 meter	Agri-found Dark Red and N-53,	Shravan 25 to Bhadra 10	Both seedling and sets

To identify an appropriate dates foe seeding to produce seedling and its effect on bulb yield have been studied. From this study the dates of seeding for seedling production, transplanting dates for off-season

¹ for social science studies

bulb production and yield performance at different altitudes for off-season production identified presented in Table 2.

Table 2: Effect of seeding dates on bulb yield from seedling

Altitude	Variety	Seeding dates	Transplanting dates	Harvesting dates	Bulb yield/Ropani
High hill >1500 meter	Agrifound Dark Red	3rd week of Jestha	Last week of Ashad	3rd week of Kartik	832
		1st week of Ashad	3rd week of Shravan	Last week of Kartik	1116
		3rd week of Ashad	Last week of shravan	last week of Kartik	1055
	N-53	3rd week of Jestha	Last week of Ashad	3rd week of Kartik	905
		1st week of Ashad	3rd week of Shravan	1st week of Mangsir	1140
		3rd week of Ashad	Last week of shravan	last week of Kartik	1170
Mid-hill 600 to 1500 meter	Agrifound Dark Red	3rd week of Jestha	Last week of Ashad	1st week of kartik	1370
		1st week of Ashad	Second week of Shravan	3rd week of Kartik	1443
		3rd week of Ashad	Last week of shravan	Last week of Kartik	1092
	N-53	3rd week of Jestha	Last week of Ashad	1st week of kartik	868
		1st week of Ashad	Second week of Shravan	3rd week of Kartik	1123
		3rd week of Ashad	Last week of shravan	Last week of Kartik	1133
Low-hill < 600 meter	Agrifound Dark Red	2nd week of Ashad	2nd weekof Shravan	Last week of Kartik	1055
		Last week of Ashad	last week of shravan	1st week of Mangsir	1333
		1st week of Shravan	1st week of Bhadra	2nd week of Mangsir	1472
	N-53	2nd week of Ashad	Last week of shravan	Last week of Kartik	960
		Last week of Ashad	2nd weekof Shravan	Last week of Kartik	1090
		1st week of Shravan	last week of shravan	1st week of Mangsir	1222

Table 2 shows that third week of Ashad is an appropriate time for sowing seed for seedling production both in high hill and mid hill. For low hill last week of Ashad and first week of Shravan is the most suitable time for seedling production for off-season onion bulb production. For convenience healthy seedling production can be done starting from 15th Jeshtha to 30th Ashad protecting from heavy rain.

Set Management

During year 1 (2064) onion sets were managed from VDD and HRD/NARC khumaltar and supplied to the farmers for trial production. During year 2 and 3 seeds were supplied to farmers and were trained to produce sets by themselves. Farmers were trained about the techniques of set production in all the three districts. For set production seeds were supplied to farmers and sowing seed from second week of Mangsir to Paush end (December to January) for set productions have been found appropriate. The summary of set production and its effect on bulb production is presented in Table 3

Table 3: Set production and its effect on off-season bulb production from set

Altitude	Variety	Seeding dates for set production	Set harvesting dates	Set transplanting dates	Bulb harvesting dates	Bulb yield/Ropani
High hill >1500 meter	Agrifound Dark Red	Mangsir 2nd week	Chaitra 2nd week	Shravan 15 to 30	Kartik last to Mangsir 1st week	1608
		Paush last week	Chaitra last week	Shravan 15 to 30	Kartik last to Mangsir 1st week	1282
	N-53	Mangsir 2nd week	Chaitra 2nd week	Shravan 15 to 30	Kartik last to Mangsir 1st week	1000
		Paush last week	Chaitra last week	Shravan 15 to 30	Kartik last to Mangsir 1st week	1443
Mid-hill 600 to 1500 meter	Agrifound Dark Red	Mangsir 3rd week	Chaitra 3rd week	Shravan 15 to Bhadra 5	Kartik last to Mangsir 1st week	1428
		Paush last week	Chaitra last week	Shravan 15 to Bhadra 5	Kartik last to Mangsir 1st week	1572
	N-53	Mangsir 3rd week	Chaitra 3rd week	Shravan 15 to Bhadra 5	Kartik last to Mangsir 1st week	975
		Paush last week	Chaitra last week	Shravan 15 to Bhadra 5	Kartik last to Mangsir 1st week	1262
Low-hill < 600 meter	Agrifound Dark Red	Mangsir 3rd week	Chaitra 3rd week	Shravan 25 to Bhadra 10	Kartik last to Mangsir 1st week	1387
		Paush last week	Chaitra last week	Shravan 25 to Bhadra 10	Kartik last to Mangsir 1st week	1327
	N-53	Mangsir 3rd week	Chaitra 3rd week	Shravan 25 to Bhadra 10	Kartik last to Mangsir 1st week	1167
		Paush last week	Chaitra last week	Shravan 25 to Bhadra 10	Kartik last to Mangsir 1st week	1443

Above table 3 showed that off-season onion can successfully be produced in all three ecological belts with little differential time of planting (Table 3). At high hills (above 1500 meter) seedling or set transplanting between Shravan 15 -30 has given the best performance. For mid-hill up to Bhadra 5 and in low hills up to Bhadra 10 gives better bulb yield. The overall performance showed that set planting was better than seedling planting. However there was no significant difference in yield between seedling and sets for bulb production. Either seedling or set can be used for off-season production depending on farmer's choice. The yield performance from seedling and set for three consecutive year and average is presented in Table 4

**Effects of transplanting dates on bulb formation of different varieties of onion**



After Bhadra 15 none of the onion varieties formed bulb due to low temperature



Dr. Raju noting observation in the field

A glance of trial field

Table 4: Yield performance kg per Ropani in different altitude, with different varieties and planting materials

Altitude msl	Variety	Planting material	2064	2065	2066	Average of three years kg/Ropani
>1500 meter	Agrifound DarkRed	Seedling	1116	833	1055	1001
		Set	1423	1608	1282	1437
	N -53	Seedling	1140	905	1170	1071
		Set	1610	1000	1443	1351
600 to 1500 meter	Agrifound DarkRed	Seedling	1443	1370	1092	1302
		Set	1442	1428	1572	1047
	N -53	Seedling	1123	868	1133	1041
		Set	1500	975	1262	1246
< 600 meter	Agrifound DarkRed	Seedling	1055	1333	1472	1287
		Set	1627	1387	1427	1480
	N -53	Seedling	960	1090	1222	1091
		Set	1138	1167	1443	1249

From table 4 it is evident that Afrifound Dark Red from set planting gives better yield compared to N -53 at all altitudes. Similarly in case of seedling also Agrifound Dark Red is slightly better than N-53 at all altitudes. However, both the varieties are at par.

Performance of other varieties:

During study, other varieties such as Red Creole, Bemausami 1, Baitadi Local were tried. Red Creole did not produced good bulb, however this variety was good for green vegetable. Bemausami 1. Was available for only one year and could not be continued. Baitadi Local was not suitable for rainy season.

Transplanting after Bhadra 15, none of the varieties at any altitude could form bulb as it can not meet the temperature requirement of above 13 degree celcius to 24 degree celcius required for bulb formation.

Result 2: Off-season onion marketing linkage between producers and traders established and regularized and onion storage demonstrated

A mini survey was conducted in district head quarters of Rasuwa, Nuwakot and Dhading and Kathmandu to find out the supply chain of fresh onion and its price fluctuation. Onion traders of project districts and 10 onion wholesalers from Kalimati, Lagankhel and Baneshwor were interviewed. The inquiries were made about the places of collection of onion from Nepal and import from outside Nepal, main season of import, months of year with highest and lowest price, packaging materials used, major places of supply in Nepal and share of Nepali onion in market. This survey was conducted during 2009 and the findings are presented in Table 5.

Table 5: Onion marketing situation in Kathmandu valley and neighbouring districts.

S. N.	Onion marketed in Kathmandu valley	Varieties	Main months of marketing	Average Wholesale price Rs./kg	Percent share in the market
1	Nepali	Red Creole Nasik Red	Chaitra-Ashad	15-20	8 -10
2	Indian	Nasik Red, Nasik Yellow	Ashad - Chaitra	30-40	80-90
3	Chinese	Not named	Asoj-Kartik	20-25	2-5

In Kathmandu valley onion from Neighbouring districts, Kavre and Terai especially from Bara, Parasa, Saptari, Rautahat, Sarlahi comes during summer. Then after July onion is imported from India and China to meet the demand. During summer onion price is lowest and it goes up as the season proceeds towards autumn and winter. Nepal market is dominated by Indian onion (80-90 percent and the share of Nepali onion is less than 10 % with small percent of Chinese onion. The keeping quality of Chinese onion is poor as it has high moisture content and larger sizes.

Based on the information collected from the wholesalers, findings of the survey were generalized. The price fluctuation of onion as wholesaler’s version is unexpected. Price is mainly governed by the onion supply from the production areas of Nepal and import from other countries.

Due to poor storage facility and sprouting problem of summer harvested Nepali onion has very short marketing period from May to July. From July/August onwards onion import from India starts until winter planted onion is again harvested in next April/May. Price of onion during April/May goes as low as Rs.15-20/Kg and from July/August onward when Nepali onion finishes, Indian onion comes into Nepali market and price goes as high as Rs.30-40/Kg.

Sub-sector analysis of onion seed

Seed is considered as high value low volume commodity that fetches high price in market. Onion is very important vegetable as well as spice crop of Nepal. Onion seed demand is high in market which is fulfilled by Nepali and Indian seed. Nepal, especially the hill areas offers diverse climatic condition that provides great opportunity to produce seeds of various vegetables including onion. Production of onion seed can have direct impact on increasing the income of hill people thereby reducing the poverty situation.

The objective of the onion seed sub-sector analysis was:

1. To find out the major varieties of onion sold in market.
2. To access the situation of onion seed in terms of demand and supply.
3. To find out the main months of onion seed purchase and sell.

Methodology:

With the major objective of finding out the situation of onion seed in market a survey was conducted in agro vets and seed selling shops of Kalimati and Lagankhel areas of Kathmandu valley. Information was collected on source of onion seed in the market, general price of purchase and sale, major varieties in the market.

Result and discussion:

Major onion seed marketed in Kathmandu valley and project districts are presented in Table 6

Table 6: Main onion varieties, marketing months with buying and selling price of onion seeds

S. No	Source of seed	Varieties	Main months of seed collection /import	Main months of seed sale	Purchase price Rs./kg	Sale price Rs./kg
1	Nepal (Rukum)	Red Creole	Jestha-Srawan	Bhadra-Kartik	400 -900	525 - 1500
2	India	Nasik Red, N-53, Agrifound Dark Red	Jestha- Srawan	Bhadra-Kartik	300 to 600	500 - 1500
3	Japan	Dark Red, T-162, Super X (Hybrids)	Jestha- Srawan	Bhadra-Kartik		

This study showed that Nepali onion seed from Rukum, Red Creole and seed from India are mostly sold in Nepali market with few amounts of Japanese hybrids. According to the surveyed traders Nepali onion seed has very good demand in market but due to irregular supply and fluctuation in price and quantity available, it is yet not possible to meet the demand from domestic Nepali production only. The price of onion seed fluctuates every year depending on supply. Indian onion varieties such as and N-53 and Nasik Red is the major one and a few quantities of Agrifound Dark Red for off-season production is in demand.

Construction and demonstration of local level onion storage structure

The major problems in regular supply of Nepali onion is sprouting and rotting due to poor storage facilities. The project supported the farmers to facilitate storage to catch better market price and regularize supply of onion through out the year. With the project support and farmer's participation the project helped to construct and demonstrate 30 onion storage structure built by using local materials. Project supported skilled labour. Farmers managed unskilled labour and local construction material.



A farmer with onion storage structures

Organization of market linkage development workshops for different stakeholders

After conducting the mini market survey for onion and onion seed sub-sector analysis, production pocket level workshops, meetings and discussion forums have been organized to share the findings and learning. Three meetings between production groups and traders were organized to establish direct communication channel to help promote marketing of off-season onion. Price information from various markets during different months of the year was shared with farmers through meetings and pocket level workshops. The meetings have been done with district level authorities and stakeholders. DADO, DDC, Cooperatives, Farmer's representatives, VDD secretary participated and discuss the future strategies to be adopted based on learning. As a result DADO Rasuwa has integrated off-season onion production program in his regular annual activity. Program Director of Vegetable Development Directorate Mr. Chut Raj Gurung visited the field of Nuwakot and Rasuwa and participated in workshop. Marketing information has collected from Kathmandu, Trishuli and Rasuwa and price trend disseminated to the farmers opened their eyes for production programming to supply onion during the time when the price is at hike.

Result 3: Farmers knowledge and skill in off-season onion production, post-harvest handling and marketing enhanced.

Within the scope of the project activities trainings, field days, and exposure visits for farmers on different subjects as planned in the project have been provided. Farmer's knowledge and skill on nursery management, off-season onion production and post-harvest handling and storage enhanced. As a result of the trainings on off-season onion nursery raising and set production, integrated plant nutrient management including compost making and FYM improvement farmers are able to adopt off-season onion production. Onion seeds and record book distributed to the farmers of each group motivated farmers to keep the record of production activities and to know the exact time of planting, intercultural operations and harvesting.

Post harvest handling training was organized during harvesting time of onion. Activities planned for cleaning, sorting, grading and packaging were demonstrated to the farmers. Farmers themselves participated in harvesting, packing and participated in storage of set and bulb both. Thus training combined with practice helped to achieve the objectives.

In addition to the training, six farmer's field days were organized at each site to acquaint the farmers with the production demonstration and experiments during particular time for effective events. Other line agency representatives and concerned stakeholders also participated in such field days.

Apart from the theory and practical exercise, participants were taken to successful field /pockets for exposure visits and field days have been organized to widened the understanding of farmers based on the principles of seeing is believing

Result 4: The project output disseminated to wider range of clients through workshops, field days and extension materials such as booklets and leaflets

The off-season production and post harvest management techniques tested, refined and verified has been prepared as booklet and leaflet in Nepali language and published. These publications are being made available to the field workers and farmers for wider application of the location and season specific techniques. The project has produced three extension and dissemination materials such as

१. बेमौसमि प्याज उत्पादन हाते पुस्तिका
२. बेमौसमि प्याज: सेट उत्पादन प्रविधि
३. प्रांगारीक मलको तयारी र प्रयोग विधि

To share the project outputs with larger stakeholders and promote dissemination, workshops have been organized at production pockets and at central level to provide forum where all the major stakeholders participated. Vegetable production and related line agencies discussed on the possibility of dissemination of the project outcomes to other parts of the district. District and central level stakeholders have been invited in the workshop. Project coordinator and other expert presented the findings and learning in the workshops

5. Discussion

Off-season onion starts from Shrawan 15th and continues up to Mangsir second week. It replaces millet from Maize – millet cropping pattern in the hills. It gives three to four times higher income from the same piece of land compared to foregone crop like millet after maize in most cases. After onion harvest, wheat or oil-seed mustard or other vegetables can also fit in the rotation. Autumn harvested onion fetches better price. The post-harvest losses are minimal during autumn and winter due to reducing temperature and will increase the net income from the same investment. As no irrigation is required and residual moisture is sufficient the cost of production is reduced. Onion production is a labour intensive enterprise and more labourers are needed during planting, weeding and production period and even landless poor farmers will be engaged in onion productions as labour in neighbour farmer's field, which will directly increase the income of landless people also and will contribute to poverty reduction. Onion production during off-season provides higher economic return and increases other economic activities also. Thus off-season onion contributes to reduce poverty harnessing the diversified climatic conditions found in the low and mid hills from late summer through autumn provides comparative advantage for off-season onion production. This project intends to increase the income and improve livelihood of hills farmers through the promotion of off-season onion production.

Some of VDCs of Nuwakot, Rasuwa and Dhading present a congenial and favourable agro-ecological environment for the production of off-season onion from rainy season to autumn. Because of the short supply of onions during this period in Nepal, it fetches higher prices. This project has been successful in harnessing this opportunities working together with the farmers of the proposed areas. The successful results obtained using comparative advantages of off-season onion production in the low hill, mid hills and high hills, farmers have accessed the production techniques to harness these opportunities.

In the given situation, this project supported farmers to acquire production and post harvest-handling skills and organize them in groups for marketing. Thus the project has been successful in addressing vegetable sub-sector to contribute to economic development.

5. Conclusion

Increased pace of commercialization of high value perishable commodities such as off-season onion involves integrated approach in availing production inputs seed, seedling and sets, technical support in production, post harvest operations and marketing. Unless all the three fronts are dealt with simultaneously, isolated effort in one front not only leads to wastage of resources but also creates negative environment and frustration on the part of actors on the success of such High Value Crop (HVC) production program. Despite considerable performance in the production of off-season onion the major constraint is the timely supply of seed for seedling and set production which is pre-requisite to off-season onion production.

In the production front, a number of constraints are apparent. First, change in developmental attitude of the poor farmers from subsistence to commercialization, change in skill and capacity of production based on market demand and development of sizable scale of production blocks in terms of their size and alignment along the major highways. Unless sizable blocks are planned commercialization effort would pay less advantage from scale economies. Second, there is no commercial scale seed production of identified onion varieties such as Agrifound Dark Red and N-53. Third, the institutionalization of production groups and its sustainability is a questionable after project phase out. Fourth, farmers groups formed to take up commercial scale production of off-season onion are weak in terms of possession of technical knowledge, skills in post harvest operations and marketing management. Their capacity to manage production inputs in package form and to link their production with markets is still need further external support.

The future impact and implication of the findings of this project will depend upon the dissemination and successful adoption of these technologies in the complex farming system of communities. It is therefore; the means of effective dissemination of technology skill training has been taken care in extension process. In the project areas technologies have been demonstrated in collaboration with GoN extension system through the support of NARDF. Therefore the rate of adoption of techniques of off-season onion production and its impacts on productivity and income will depend on the effective and practical training carried out in other areas and the extension materials developed are disseminated properly. Hence, any post evaluation of the project should be concentrated in the areas where such demonstration is carried out during uptake pathways.

6 Recommendation

With the successful completion of the project and lessons learnt the following recommendations have been made for the continuity and sustainable scaling up of the findings:

1. The future impacts of findings of this project depend upon the dissemination and successful adoption of the recommended location specific production techniques and establishment seed supply chain. Availability of seeds of identified varieties is the key inputs for continuity. Presently, the seeds of N-53 and Agrifound Dark Red are imported from India by traders. Many times the export of variety Agrifound Dark Red from India is banned and is made available by readers through informal smuggling. The seed production of this variety is being initiated in Citrus Development Farm Palpa. This initiative should be integrated in research and seed production in commercial scale through public-private partnership under regular annual program of NARC, DoA and private sector.
2. For sustainable scaling up and continuity of off-season onion production and marketing, it should be included in regular program of government extension in all the potential districts such as Dhading, Chitawan, Nawalparasi, Nuwakot, Rasuwa and Kavre etc. In specific the following activities have been suggested
 - Seed production of identified varieties in appropriate locations such as Surkhet, Dailekh, etc should be regularized.

- Dissemination of technology through government extension and non governmental and private agencies in collaboration and coordination to the farmers.
- Awareness raising trainings to onion collectors, wholesalers. And traders for off-season marketing and storage
- Extensive dissemination of project produced extension materials. To farmers and stakeholders

Establishment of seed and technology transfer chain.

6. Acknowledgement

Nepal Horticulture promotion Center (HOPROC/Nepal) is grateful to National Agricultural Research and Development Fund for awarding this very important project " **Promotion of Off-season onion production for import substitution (FPP 419)**" to undertake in Central Development Region where off-season onion was a felt need. Marketing was potential in Kathmandu and local markets. HOPROC/Nepal) also highly appreciates the generosity of the farmers of project areas of Dhading, Nuwakot and Rasuwa. We also highly acknowledge the help and cooperation given to us during project implementation by the field Technician (JT/JTAs) of Agriculture Service Centers of the project areas and DADOs, Horticulture Officers and Plant Protection Officers of Dhading, Nuwakot and Rasuwa districts. HOPROC/Nepal) is highly grateful to Mr. Mahendra Man Shrestha DADO/Dhading, Mr. Rajaram Adhikari. DADO Nuwakot and Mr. Ramchandra Paudel DADO Rasuwa for their valueable help and suggestions. HOPROC/Nepal) acknowledges the involvement of team members Messrs Indra Raj Pandey, Dr. Raju Raj Pandey, Mr. Rajendra Prasad Acharya, Mr. Dhruva Raj Bam, Mr. Rajendra Prakash Pandey, Mr. Pradip Neupane, Mr. Prabesh Raj Pandey, and Mr. Diwash Bista and Mr. Netra Badur Thapa.

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Annex 1 Summary of geographical coverage and number of participant farmers for off-season onion production

Districts	VDCs	Pocket areas	Altitude msl	No of groups	Female	Male	Total
Nuwakot	Kaule	Kaule	1400	1	17	1	18
		Rawalasuwara	750	1	3	5	8
	Khanigaun	Bohorapani	750	1	3	5	8
	Bidur Municipality	Majhitar, Pipaltar	550	1	9	0	9
	Belkot	Belkot	950	1	0	28	28
Dhading	Kalleri	Salyantar	750	1	3	9	12
	Baireni	Chhaptole	720	1	0	9	9
	Baireni	Rimaltole	650	1	0	9	9
Rasuwa	Dhaibung	Jibjibe	1650		23	7	30
	Dhaibung	Gairaghar	1650	1	21	0	21
	Laharepauwa	Bogatitar	1200	1	21	9	30
	Laharepauwa	Majhgaun	755	1	18	7	21

अनुसूचि २: अध्ययन परिक्षणमा भागलिने कृषकहरु

बेमौसमि प्याज उत्पादन परिक्षण						
जिल्ला	रसुवा	प्याजको जात: एग्रीफाउण्ड डार्क रेड				
ल्यट साईज ५ बर्ग मिटर						
बेर्नाबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग,जिबजिबे	२०६४	०३/१५	०४/२२	०७/२२	१३.३३	१३३३
अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		०३/१२	०४/२५	०७/२८	१०.००	१०००
मेनुका पौडेल, धैबुङ्ग,जिबजिबे		०३/१८	०४/२६	०७/२८	११.६७	११६७
बाल कृष्ण घिमिरे, लहरेपौवा,माभ्रगांउ		०३/१४	०४/२४	०७/२२	१३.३३	१३३३
अर्जन अधिकारी, लहरेपौवा,माभ्रगांउ		०३/१८	०४/२२	०७/२२	१०.००	१०००
कृषकको नाम र ठेगाना	२०६५	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग,जिबजिबे		०२/२५	०३/२२	०७/१२	६.६५	६६६

अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		०२/१२	०३/२५	०७/१८	६.६५	६६६
मेनुका पौडेल, धैबुङ्ग, जिबजिबे		०२/१८	०३/२६	०७/१८	११.६७	११६७
बाल कृष्ण घिमिरे , लहरेपौवा, माभ्रगाँउ		०२/१४	०३/२२	०७/१२	६.६५	६६६
अर्जन अधिकारी, रेपौवा, माभ्रगाँउ		०२/१८	०३/२२	०७/१२	५.००	५००
कृषकको नाम र ठेगाना	२०६६	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग, जिबजिबे		०२/१०	०३/२२	०७/१६	१३.३३	१३३३
अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		०२/१२	०३/२५	०७/२३	११.६७	११६७
मेनुका पौडेल, धैबुङ्ग, जिबजिबे		०२/१४	०३/२६	०७/२६	६.६५	६६६
बाल कृष्ण घिमिरे , लहरेपौवा, माभ्रगाँउ		०२/१४	०३/२२	०७/२२	१०.००	१०००
अर्जन अधिकारी, लहरेपौवा, माभ्रगाँउ		०२/१३	०३/२२	०७/२४	११.६७	५००
बेमौसमि प्याज उत्पादन परिक्षण						
जिल्ला	रसुवा	प्याजको जात: एन -५३				
ल्यट साईज ५ बर्ग मिटर						
सेटबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग, जिबजिबे	२०६४	-	०४/२२	०७/२२	20	<u>2000</u>
अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		-	०४/२५	०७/२८	१३.३३	१३३३
मेनुका पौडेल, धैबुङ्ग, जिबजिबे		-	०४/२६	०७/२८	१५.००	१५००
बाल कृष्ण घिमिरे , लहरेपौवा, माभ्रगाँउ		-	०४/२४	०७/२२	१६.६७	१६६५
अर्जन अधिकारी, लहरेपौवा, माभ्रगाँउ		-	०४/२२	०७/२२	१६.६७	१६६५
कृषकको नाम र ठेगाना	२०६५	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग, जिबजिबे		०८/१५	०४/१२	०७/१२	८.३३	८३५
अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		०८/१२	०४/१४	०७/१८	८.३३	८३५
मेनुका पौडेल, धैबुङ्ग, जिबजिबे		०८/१८	०४/१५	०७/१८	१३.३३	१३३३
बाल कृष्ण घिमिरे , लहरेपौवा, माभ्रगाँउ		०८/१४	०४/२२	०७/१२	८.३३	८३५
अर्जन अधिकारी, लहरेपौवा, माभ्रगाँउ		०८/१८	०४/२५	०७/१२	६.६५	६६६

कृषकको नाम र ठेगाना	२०६६	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
भबनाथ पौडेल, धैबुङ्ग,जिबजिबे		०९/३०	०४/२९	०७/२९	१८.३५	१८३५
अर्जुन न्यौपाने, धैबुङ्ग, जिबजिबे		०९/२७	०३/२८	०८/०२	१५.००	१५००
मेनुका पौडेल, धैबुङ्ग,जिबजिबे		०९/२९	०५/०२	०७/२६	१०.००	१०००
बाल कृष्ण घिमिरे , लहरेपौवा,माझगाँउ		०९/२८	०५/०१	०८/०३	१५.००	१५००
अर्जन अधिकारी, लहरेपौवा,माझगाँउ		०९/३०	०४/२८	०८/१४	८.३३	८३५
जिल्ला नुवाकोट	प्याजको जात: एग्रीफाउण्ड डार्क रेड					
ल्यट साईज ५ बर्ग मिटर						
बेर्नाबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		०२/१५	०३/२२	०६/२२	१३.३३	१३३३
शुशिला पौडेल , काउले-१	२०६४	०२/१५	०३/२२	०६/२२	१३.३३	१३३३
उद्वब थापा , काउले-१		०२/२५	०३/२७	०६/२४	१८.३३	१८३५
रामचन्द्र थापा, काउले-१		०२/२३	०३/२९	०६/२३	20	2000
निता पाण्डे , बिदुर -५		०२/१४	०३/२४	०७/२२	६.६५	६६६
भवानी शाही खानीभाउं - १		०२/१८	०३/२२	०७/२४	१०.००	१०००
कृषकको नाम र ठेगाना	२०६५	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		०२/२७	०३/२९	०७/१२	१५.००	१५००
शुशिला पौडेल , काउले-१		०२/२७	०३/२९	०७/१०	१०.००	१०००
उद्वब थापा , काउले-१		०२/२७	०३/२९	०७/१२	१५.००	१५००
रामचन्द्र थापा, काउले-१		०२/२६	०३/२९	०६/११	21.65	2165
निता पाण्डे , बिदुर -५		०२/२३	०३/३०	०७/१३	५.००	५००
भवानी शाही खानीभाउं - १		०२/२४	०३/२६	०७/१०	५.००	५००
कृषकको नाम र ठेगाना	२०६६	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		०२/०५	०३/२२	०७/२२	१५.००	१५००
शुशिला पौडेल , काउले-१		०२/०५	०३/२२	०७/२२	१५.००	१५००
उद्वब थापा , काउले-१		०२/१५	०३/२३	०७/१४	११.६७	११६७
रामचन्द्र थापा, काउले-१		०२/१३	०३/२२	०७/२३	११.६७	११६७
निता पाण्डे , बिदुर -५		०२/१४	०३/२४	०७/१२	८.३५	८३५

भबानी शाही खानीभाउं - १		०२/१४	०३/२२	०७/१४	६.६६	६६६
जिल्ला नुवाकोट	प्याजको जात: एन -५३					
ल्यट साईज ५ बर्ग मिटर						
सेटबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		-	०४/२६	०७/२८	१५.००	१५००
शुशिला पौडेल , काउले-१	२०६४	-	०४/२३	०७/२६	20	<u>2000</u>
उद्वब थापा , काउले-१		-	०४/२४	०७/२४	१३.३३	१३३३
रामचन्द्र थापा, काउले-१		-	०४/२६	०७/२८	१५.००	१५००
निता पाण्डे , बिदुर -५		-	०४/२४	०७/२४	१३.३३	१३३३
भबानी शाही खानीभाउं - १		-	०४/२२	०७/२५	१०.००	१०००
कृषकको नाम र ठेगाना	२०६५	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		०८/१३	०४/२२	०७/१८	१३.३३	१३३३
शुशिला पौडेल , काउले-१		०८/१७	०४/१२	०७/२२	८.३५	८३५
उद्वब थापा , काउले-१		०८/१३	०४/२२	०७/१८	१३.३३	१३३३
रामचन्द्र थापा, काउले-१		०८/१७	०३/१६	०७/२८	८.३५	८३५
निता पाण्डे , बिदुर -५		०८/१६	०४/१२	०८/०२	११.६७	११६७
भबानी शाही खानीभाउं - १		०८/१४	०४/१५	०७/२२	१०.००	१०००
कृषकको नाम र ठेगाना	२०६६	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
युद्ध कुमारी बोगटी		०९/२७	०५/०२	०७/२२	१०.००	१०००
राधिका पौडेल , काउले-१		०९/२५	०५/०२	०७/२९	१६.६५	१६६५
उद्वब थापा , काउले-१		०९/२७	०४/२८	०८/१२	20	<u>2000</u>
रामचन्द्र थापा, काउले-१		०९/२७	०५/०२	०७/२२	१०.००	१०००
निता पाण्डे , बिदुर -५		०९/२८	०४/२९	०८/१३	१५.००	१५००
भबानी शाही खानीभाउं - १		०९/३०	०४/२७	०८/१६	८.३५	८३५
जिल्ला धादिङ	प्याजको जात: एग्रीफाउण्ड डार्क रेड					
ल्यट साईज ५ बर्ग मिटर						
बेर्नाबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २		०४/१८	०५/२४	०७/२६	१५.००	१५००

कमला ढुगाना कल्लेरी- २		०४/१८	०५/२३	०७/२८	११.६७	११६७
रमेश पन्त बैरेनी - ९		०४/१८	०५/२४	०७/२५	११.६७	११६७
पुष्प रिमाल बैरेनी - ८	२०६४	०४/१४	०३/२२	०७/२५	८.३५	८३५
हरि भण्डारी बैरेनी - ९		०४/१८	०३/२३	०७/२३	१०.००	१०००
कृषकको नाम र ठेगाना	२०६५	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २		०२/२६	०३/२९	०८/०४	१३.३३	१३३३
कमला ढुगाना कल्लेरी- २		०२/२२	०३/२५	०८/०४	दृछ	2500
रमेश पन्त बैरेनी - ९		०२/२४	०३/२७	०७/२८	११.६७	११६७
पुष्प रिमाल बैरेनी - ८		०२/२२	०३/२६	०८/०४	८.३५	८३५
हरि भण्डारी बैरेनी - ९		०२/२४	०३/२९	०७/२९	१०.००	१०००
कृषकको नाम र ठेगाना	२०६६	बीउ रोपेको मिति	बेर्ना सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २		०२/१०	०३/२४	०८/०९	20	<u>2000</u>
कमला ढुगाना कल्लेरी- २		०२/१२	०३/२२	०८/०९	23..35	2335
रमेश पन्त बैरेनी - ९		०२/१४	०३/२५	०७/२९	११.६७	११६७
पुष्प रिमाल बैरेनी - ८		०२/१५	०३/२५	०७/२८	१३.३३	१३३३
हरि भण्डारी बैरेनी - ९		०२/१४	०३/२४	०७/२५	५.००	५००
जिल्ला धादिङ	प्याजको जात: एन -५३					
ल्यट साईज ५ बर्ग मिटर						
सेटबाट गाना उत्पादन						
कृषकको नाम र ठेगाना		सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २	२०६४	-	०५/०३	०८/०६	९	९००
कमला ढुगाना कल्लेरी- २		-	०५/०४	०८/०४	७	७००
रमेश पन्त बैरेनी - ९		-	०५/०६	०८/०८	५	५००
पुष्प रिमाल बैरेनी - ८		-	०५/०४	०८/०४	८	८००
हरि भण्डारी बैरेनी - ९		-	०५/०२	०८/०५	५	५००
कृषकको नाम र ठेगाना	२०६५	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति ल्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २		०८/२०	०५/०७	०८/२७	१३.३३	१३३३
कमला ढुगाना कल्लेरी- २		०८/२२	०५/०२	०८/१९	१८.३३	१८३३
रमेश पन्त बैरेनी - ९		०८/२३	०५/०७	०८/२६	८.३३	८३३

पुष्प रिमाल बैरेनी - ८		०८/२०	०५/०२	०८/२२	१०.००	१०००
हरि भण्डारी बैरेनी - ९		०८/२३	०५/०५	०८/२१	८.३३	८३३
कृषकको नाम र ठेगाना	२०६६	सेटको लागि बीउ छरेको मिति	सेट सारेको मिति	गाना उखेलेको मिति	प्रति त्यट गाना उत्पादन केजि	प्रति रोपनि उत्पादन केजि
बल बहादुर ढुगाना कल्लेरी- २		०९/१५	०५/०५	०८/०२	26.66	2666
कमला ढुगाना कल्लेरी- २		०९/१७	०५/०५	०८/०२	26.66	2666
रमेश पन्त बैरेनी - ९		०९/१७	०५/०३	०८/०२	११.६७	११६७
पुष्प रिमाल बैरेनी - ८		०९/१८	०४/०४	०८/०३	११.६७	११६७
हरि भण्डारी बैरेनी - ९		०९/१६	०५/०२	०८/०६	६.६५	६६५