Annex 9: Main Project Completion Report

The main body of the Project Completion Report should be a **maximum** of 10 pages, plus selected attachments. It is important to be accurate, concise and to include all the relevant information.

1. Background

The in country production of onion bulbs contributes to less than half the national demand. The short fall is made good from import mainly of Indian onion especially during the lean period when the market prices remain high. This coincides with the major festive period in Nepal. This led to undertaking of this project with focus in terai of Nawalparasi and inner terai of Chitwan.

The major target group of the project was the vegetable growers of terai of Nawalparasi and inner terai of Chitwan.

The major collaborators of the project were DADO offices and Agriculture Service Centres of Chitwan and Nawalparasi. The other collaborators were some of the NGOs such as FORWARD.

The scope of the project was to identify off season production technology and demonstrate, explore possibilities of short duration seed production, building farmers capacity and dissemination of the technologies among the farmers of inner terai of Chitwan and terai of Nawalparasi (log frame attached).

2. Research implementation performance

Activities completed:

a. More than 25 literatures on offseason onion from various sources were collected, reviewed and documented. Also information on the present status of onion in Chitwan and Nawalparasi was collected.
b. For field experimentation selection of suitable sites and innovative farmers were done with the help of respective DADO offices as well as Agri service Centre.
c. The research experiments were designed. The materials required for the experiments were procured and managed. The field experiments were conducted at farmer's field in both the districts. Data were collected on various aspects of offseason onion and seed including yield. Suitable varieties (AFDR and N-53) and appropriate dose of FYM, N:P:K (30 t FYM, 120 kg N, 60 P2O5 and 60 K2O per ha.) were identified.
d. Economic analysis of the harvested off-season onion bulbs was done. The highest benefit cost ratio was given by AFDR at 120 Kg N per hectare in both districts.
e. 5 farmers groups (FG) were formed in 4 VDCs of Chitwan. Likewise, FGs were formed in five VDCs of Nawalparasi. Each FG consisted of 10 farmers both man and woman.
f. Participatory supervision, monitoring and evaluation of the field experiments were done by a team consisting of the project coordinator, the DADOs of respective districts, the experts and the research assistants in the middle of first year second /trimester. Interaction was done with the farmers in the field plots. Suggestions were given for further actions to be taken.
g. Post harvest study of the harvested offseason bulb onion was done at farmers' houses both in Sukranagar of Chitwan and Sunawal of Nawalparasi during March to Oct, 2008. The study revealed that it was not advisable to store the bulb beyond three

months after bulb harvest.

h. Seed production study (March to Oct, 2008) in Sukranagar and Sunawal was done to explore possibilities of short duration onion seed production from offseason bulb harvested. AFDR was better than N-53 for seed production producing 2.5 to 3.5 g per plant on an average.

i. Training of the farmers:

All together 65 farmers, both male and female, from both the districts were given training on various aspects of offseason onion. Experts from IAAS Rampur and DADOs of both the districts were resource persons. Some progressive farmers also worked as resource person. IAAS Horticulture Farm and halls and DADO office halls were used.

j. Production demonstration:

A total of approximately 50 farmers each from both the districts participated in the production demonstration. Although the participation was satisfactory the area coverage was not as expected. Several farmers could not raise good nursery it being little tricky. However, those who raised good nursery were able to harvest good crop. Several farmers harvested green onion and sold because of good market price.

k. Seed multiplication and quality testing:

15 farmers of Chitwan and 10 farmers of Nawalparasi participated in the onion seed production and multiplication program. In both the districts approximately 50% of them could produce seed of AFDR and a few of them produced seed of N-53. The major problem was that at the time of seed maturity, rain and hailstorm caused damage. Diseases and wind were also other factors to cause damage. Thus, the quality of the seed was also reduced.

l. Improved low cost storage establishment and demonstration:

With the help of Mr. Buddhi Ram Chaudhary, a Tharu resource person, a modified but improved verson of Khonga (a Tharu storage structure of onion or potato, made up of local materials such as Khadai and Rope) was designed and constructed. The constructed model structure was demonstrated in one of the participating farmer's house which was road accessible in each district. The farmers were gathered, demonstrated the method of constructing the storage structure, distributed the leaflets regarding building of the structures and interacted among the farmers, extension workers, NGOs and the students. This was done during Nov, 2008 – June, 2009.

m. Market linkage:

During Nov,2008 to Feb,2009 and March to June,2010, the project created forum for interaction among the participating farmers, some selected traders of big markets like Narayanghat and Sunawal and created market link between the farmers and traders. Earlier to this, some of the key traders of big markets were already identified, and were requested to participate in the forum for market discussion.

n. Farmers' Field Day (FFD):

During Nov, 2008 to Feb, 2009, FFD was organized both in Sukranagar VDC, Chitwan and Swathi VDC, Nawalparasi. The farmers of FG, DADO, extension agents, NGOs and students participated. The standing crop of the demonstration plot was exhibited. Interaction was held. Suggestions were given. During the gathering, leaflets consisting of technical information on off season onion were distributed

among the audience. Also the seed produced by offseason bulb were displayed and demonstrated.

o. Publication and distribution of extension materials:
Various leaflets and brochurs containing technical information on offseason onion production, seed production, postharvest handling and storage were published and distributed. Booklets on offseason onion and seed production technology in terai and inner terai based on the research findings were published and distributed among the farmer, DADOs and their offices, JT, JTAs of Agri Service Centre, NGOs and agriculture students.

p. Workshop seminar:
A one day work shop seminar was organized at IAAS, Rampur in the last trimester. About 50 farmers of both the districts, DADOs, JT, JTAs of Agri Service Centre, NGOs, traders, experts, and IAAS students participated in the work shop. The suggestions were brought up. The major thrust of the workshop was that there should be continuity in the project, provision of subsidy, need variety with thin neck and single bulb only, foundation seed made available, and need to form group to pressure the government.

The major problem during implementation of the project were

i. Acquisition of off season varieties and their seed availability in time for sowing in Jesth Ashad. Consequently the sowing delayed.
ii. The farmers were reluctant to produce bulb and seed because the seed production was new to them. In bulb, there was problem of sprouting, widened neck, doubling of bulb. So, they preferred growing green onion because it was short duration, less risky, immediate cash generating, high value and high market demanding item (in festive months the market is very good).

3. Situation regarding delivery of outputs/results

Results achieved:

1. Two varieties namely Agri Found Dark Red (AFDR) and N- 53 have been identified as suitable varieties for offseason bulb and green onions in terai and inner terai of Nawalparasi and Chitwan. The suggested amount of nutrients was 30 tons of FYM, 120 kg N, 60 Kg each of Phosphorus and potash per hectare.
   But there were some drawbacks associated with these varieties. Sprouting, wide neck and doubling of the bulbs are some of the negative points. So, further testing of new offseason varieties is suggested for the future. Effort at government level is needed to bring off season varieties from India. However, for green onions the farmers have fully adopted and they prefer this.
2. They feel problem in nursery raising. So, special groups who take up nursery raising enterprise should be developed.
3. Suggested time for sowing seed is Jesth to Ashad and time of seedling transplanting Ashad to Sawan at 20 x 15 cm.
4. Seed production of onion by planting of offseason bulb is possible. AFDR was better than N-53. For this, earlier the bulb planting (by Magh), better would be the result

(earlier maturity of the seed by Baisak so no coincidence with rain, hailstorm, disease, high temperature and high humidity).

5. Seed production was new introduction to the farmers of the project area. They were reluctant to undertake this enterprise because it was long duration and needs higher level of technicality and management. The price of the seed was also not attractive. There was no reliable source of foundation seed. Some subsidies would be desirable in the beginning phases.

4. Prospects for the adoption of the new technology and achievement of purpose

The farmers have preferred and adopted growing green onion and bulb onion was their 2nd option as it was long duration and was associated with some drawbacks such as sprouting, wide neck and doubling of bulbs.

Some of the progressive farmers have done cultivation in large scale with an objective of producing green onion for Dashain and Tihar. For small scale farmers nursery raising and transplanting may be little cumbersome as it needs some higher level of management and care. However, they have participated in training; they have been provided with technical information. The traders were willing to buy the produce. Some agrovets of Butwal and Narayanghat can bring seeds for them.

5. Key indicators of potential impact identified by project stakeholders

i. Rise in the acreage of offseason in rainy season.
ii. Rise in the flow of green onions as well as off season bulbs in the market, local or big.
iii. Rise in the sale of seeds for rainy season onion production in agro vets of big markets.
iv. More need of technical help in the nursery raising, plant protection and seed production.

6. Proposed follow-up

i. Need to bring more new varieties of off season onion especially from India through Government initiative and abroad and test them not only for yield but also to search for such varieties which don't sprout, possesses thin neck and produce single bulb. This is because variety development may take long time but need to start our own breeding program.
ii. Follow up training on nursery raising and seed production techniques may be needed. The project coordinator is always ready to help in this matter.

7. Lessons learned

i. Actually we lack such varieties which are free of drawbacks. Constant exploration is needed whether it be indigenous or exotic specially India. The easiest would have been to bring various offseason varieties from India and testing in various location of Nepal. But India has banned sending varieties outside. So effort should be made at government level to facilitate the import and exchange of various germplasms of onion.
ii. There is no timely release of the fund.
iii. There should be program of germplasm collection, maintenance and variety development. IAAS and NARC should take initiative in this respect.
iv. The results of the project have revealed beyond doubt that there is good possibility of producing seeds in short period in inner terai and terai but it was not free of problem. Seed production studies should be done at various altitude of Nepal with the cooperation of different farms and agriculture center.
v. There should be provision of subsidy for seed at least for 5 years.

8. Publications and contacts

I. Shakya, S.M.; K.K. Dahal; S. Shakya; M. Dhital; B.R. Chaudhary and M. Basnet, 2067. "Terai tatha vitri madheshma bemausami pyaj tatha biu utpadan prabidhi". Institute of Agriculture and Animal science, Rampur, Chitwan, Nepal and National Agricultural Research and Development Fund, Kathmandu(in Nepali).

II. Shakya, S.M.; S. Shakya and M. Dhital, 2066. "Terai tatha vitri madhesma bemausami pyaj kheti". Institute of Agriculture and Animal Science, Directorate of Research (in Nepali) Rampur, Chitwan.

III. Shakya, S.M.; B.R. Chaudhary; M. Dhital and S. Shakya, 2066. "pyaj bhandaran garne sthyaniya samrachana(sudhariyeko Khonga)". Institute of Agriculture and Animal Science, Rampur, Chitwan and NARDF, Kathmandu.

IV. Dahal, K.K., 2009. Performance of onion varieties at different level of Nitrogen for offseason bulb production in Chitwan and Nawalparasi district. M.Sc. thesis submitted to Tribhuvan University, IAAS, Rampur, Chitwan, Nepal.

V. Shakya, S., 2009. Effect of plant population on bulb size and yield of marketable bulbs of onion varieties during offsesason. M.Sc. thesis submitted to Tribhuvan University, IAAS, Rampur, Chitwan, Nepal.

VI. Dhital, M., 2009. Effect of different levels of noitrogen on commercial onion varieties for off season green production in western Chitwan. M.Sc. thesis submitted to Tribhuvan University, IAAS, Rampur, Chitwan, Nepal.

VII. AEC, 2006. Vegetable seed production. Agro Enterprise Centre, Kathmandu, Nepal.

Name of the project team and addresses:

1. Prof. Dr. Shanta Man Shakya, IAAS, Rampur. Tel No. 056591191, Mob. 9845064381, email: santa_shakya06@yahoo.com
2. Mr. Ramananda Kurmi, Senior Agriculture Development Officer, District Development Agriculture Office, Parasi, Nawalparasi. Phone No. 078520126, Mob 9847053418.
3. Laxman Pd. Poudel, Senior Agriculture Development Officer, District Development Agriculture Office, Bharatpur, Chitwan. Phone No. 056520115. Mob 9855059570.
4. Forum for rural welfare and agriculture research and development (FORWARD), Bharatpur, Chitwan. Phone 056527623, 056521523.
5. Mr. Keshav Kumar Dahal, M.Sc. (Horticulture) and Research Assistant. Mobile No: 9842059568
6. Mr. Subodh Shakya, M. Sc. (Horticulture) and Research Assistant. Mobile No.:9752004150.
7. Mr. Madhav Dhital, M.Sc. (Horticulture) and Research Assistant. Mobile No. 9848549191.

NARDF Technical Paper Series Report

This is the precise form of the Project Completion Report based on scientific writing for wide circulation through different media.

Abstract

An experiment was conducted in the plain areas of Chitwan and Nawalparasi districts in 2007-08 taking three varieties of onion namely: Agrifound Dark Red (AFDR), N-53 and Dadeldhura Local (DL) and three levels of nitrogen (N): 40, 80 and 120 kg/ha in split plot design with nitrogen (N) as main plot and varieties as sub-plot to identify suitable varieties and optimum dose of N for off-season bulb production. Analysis over locations showed that the marketable bulb yield of AFDR (25.22 t/ha) was significantly higher than that of N-53 (19.70 t/ha) and DL (1.11 t/ha). At 120 kg N/ha, marketable bulb yield of onion was 16.89 t/ha in Chitwan and 16.43 t/ha in Nawalparasi. The percent double bulb was significantly higher in Chitwan (27.08%) than in Nawalparasi (22.97%). N-53 ranked second in yield in both districts. It yielded 21.76 t/ha at 120 kg N/ha in Chitwan and 21.34 t/ha at same dose of N in Nawalparasi condition. Benefit cost (B: C) ratio of AFDR was higher (2.92) at higher level of N (120 kg/ha) than B:C ratio of N-53 (2.43) at the same dose of N in Nawalparasi. Similarly, B:C ratio of AFDR(3.06) was higher than that of N-53 (2.47) at 120 kg N/ha in Chitwan. The bulb yield and quality of DL was poor. This can be grown for green purpose.

Keyword

Off-season onion, seed to seedling method

1. Introduction

Onion is one of the important spice crops in Nepal. About 1, 72,830 tons of bulb onion was produced from 13,656 ha during 2006/07 in Nepal (VDD, 2007). There is steady demand of onion bulb throughout the year. It is increasing every year in Nepal. The per capita consumption of onion in Nepal is 7.7 kg per annum (Koirala et al., 1995). Nepal invested NRs. 968 million (MoAC, 2006) to import vegetables from India during 2004/05. It is one of the major items of imported vegetables. Nepal also imported the onion bulbs amounting to NRs. 943 million in the same year from overseas. Nepal imported 30,781 tons of onion from Nasik, India during 2008 (REPUBLICA, 2009). Transaction of bulb onion has increased from 8,074 tons in 2003 to 12,733 tons in 2006 in the Kalimati Vegetable and Fruits market, Kathmandu. Out of the total quantity, Indian onion contributed 97%. The price of onion varies due to production and supply from India. Wholesale price of onion went as high as NRs. 100.00/kg during the period of Dashain festival in 2007 (Gautam, 2007).

Nepal fulfils its high demand during June to December by importing onion bulbs from India (Budathoki, 2006). The storage loss goes as high as 88 % (Srivastava and Sharma, 1993) during this period, which hinders the supply of domestic produce in the market.

Efforts have been made for off-season onion production to substitute the import. Traditionally, off-season onion bulb is produced through the set obtained from previous year's sowing of seed. Alternatively, off-season onion can be produced through transplanting of onion seedlings produced by sowing the seed during June to July (Budathoki, 2006). In addition to bulbs, farmers can get immediate income from selling

of green top from off-season onion (Rokaya and Bhandari, 2004; Gautam, 2006). This profitable business gives cost benefit ratio of 3:7.1 (Singh et al., 1995).

The heat tolerant varieties with yield potential ranging from 15 to 25.9 t/ha, and suitable for July planting have been developed (AVRDC, 1994). Mohanty and Prusti (2002) screened 12 Kharif season varieties and found the yield up to 22.85 t/ha in Inida. Different transplanting dates such as 3rd August (Katwale and Bisen, 1986) in Chhindwara, India and 15th August in Western Hills of Nepal (Gautam, 2006), have been suggested for off-season onion production. Varieties and transplanting dates determine the off-season onion yield.

The general objective of the study is to increase the income of the vegetable growers through off-season onion production. The specific objectives of the study are

- To evaluate the performance of different varieties of onion for off-season bulb production
- To identify the optimum level of nitrogen for off-season onion bulb production

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

The experiment was conducted at Sukranagar Village Development Committee (VDC) in Chitwan and Sunawal VDC in Nawalparasi, Nepal from June 2007 to February 2008. Three levels of nitrogen (40, 80, 120 kg/ha) as main plot factor and three varieties namely, Agrifound Dark Red (AFDR), N-53 and Dadeldhura Local (DL) as sub-plot factor were laid out in split plot design. Four farmers as replicate were used in each district. The size of each sub-plot was 2.4*1.8 m^2 and contained 144 plants at the spacing of 20*15 cm. Each net plot contained 100 plants.

Potash and phosphorous were used at 60 kg/ha each and nitrogen was used at three levels: 40, 80 and 120 kg/ha. Potash, phosphorous and half of the nitrogen were used as basal dose and remaining half of nitrogen was top dressed at 50 days after transplanting (DAT). Farm yard manure (FYM) was used at the rate of 30 t/ha. Seed bed was prepared for seedling production. The seed bed was raised 15 cm for facilitating the drainage in the rainy season. Half plastic tunnel was prepared for protecting the seed bed from direct splash of rain water. Seed was sown in row in 3rd week of Shrawan (July-August) and transplanted in 1st week of Asoj (Sept-Oct).

Observations were taken on number of leaves/plant, plant height and plant stands at different DAT. Other parameters recorded were percent bolting and percent doubled bulbs. The other important yield and yield attributing characters observed were biological yield, bulb yield and marketable bulb yield.

The data were analyzed by using MSTAT-C software package.

3. Results and Discussion

3.1. Plant stands (%) at harvest in two locations

The plant stands was significantly higher in Nawalparasi (71.33 %) compared to Chitwan (50.63 %)(Table 1). Similarly, the plant stands of variety Agrifound Dark Red (68.75 %)

was significantly higher than that of two varieties, i.e. N-53 (62.08 %) and Dadeldhura Local (52.12 %). The levels of nitrogen didnot affect the plant stand at harvest. There was no interaction effect of locations and varieties on plant stand at harvest.

Gautam et al. (2006) reported that the plant stands at harvest did not differ significantly but this result contradicted with the present findings. They reported that the plant stand at harvest was 77.7%. But, their finding is in agreement with the present findings that the mean plant stand declined with the advancement of planting dates. In the present finding the plant stand was 67.36% at 45 DAT, 65.40% at 60 DAT and 56.25% at harvest. Highest mortality was observed in the early stage.

3.2. Bolted plants (%) in two locations

The percent bolted plant was significantly higher in Nawalparasi (1.38 %) than in Chitwan (0.75 %) (Table 1). Similarly, the bolted plant (%) of variety Agrifound Dark Red (2.00 %) was significantly higher than that of two varieties i.e. N-53 (1.00 %) and Daldeldhura Local (0.00 %). The levels of nitrogen did not affect bolting of plants. There was no interaction effect of locations and varieties on bolting.

3.3. Double bulbs (%) in two locations

The percent double bulbs were significantly higher in Chitwan (27.08 %) than that of Nawalparasi (22.97 %) (Table 1). Similarly, the double bulb was significantly higher in Dadeldhura Local (38.75 %) than that of the other two varieties i.e. Agrifound Dark Red (18.62 %) and N-53 (17.70 %). The levels of nitrogen did not affect the percent double bulb. There was no significant effect of locations and varieties on double bulb (%).

3.4. Biological yield in two locations

The biological yield was significantly higher in Chitwan (9.80 kg/plot) than that of Nawalparasi (7.75 kg/plot) (Table 2). Similarly, variety Agrifound Dark Red (10.62 kg/plot) produced higher biological yield than the other two varieties i.e. N-53 (9.52 kg/plot) and Dadeldhura Local (6.17 kg/plot). The levels of nitrogen did not affect biological yield. There was no significant effect of interaction of locations and varieties on biological yield. However, Agrifound Dark Red (11.42 kg/plot) produced higher biological yield in Chitwan and Dadeldhura Local (5.40 kg/plot) produced the lowest biological yield in Nawalparasi.

3.5. Bulb yield in two locations

The overall bulb yield was significantly higher in Chitwan (5.48 kg/plot) than that of Nawalparasi (4.76 kg/plot) (Table 2). Variety Agrifound Dark Red (7.25 kg/plot) produced higher bulb yield than the other two varieties i.e. N-53 (5.81 kg/plot) and Dadeldhura Local (2.30 kg/plot). The levels of nitrogen did not affect bulb yield.There was no significant effect of interaction of locations and varieties. However, Agrifound Dark Red (7.56 kg/plot) produced the highest bulb yield in Chitwan and Dadeldhura Local (1.88 kg/plot) the lowest in Nawalparasi.

3.6. Marketable bulb yield (kg/plot) in two locations

The overall marketable bulb yield was higher in Chitwan (4.31 kg/plot) than that of Nawalparasi (3.96 kg/plot) (Table 2). There was no significant effect of levels of nitrogen on marketable bulb yield. However, the yield was highest (4.50 kg/plot) at 120 kg N/ha and was lowest (3.87 kg/plot) at 40 kg N/ha. Agrifound Dark Red produced significantly highest yield (6.81 kg/plot) whereas Dadeldhura Local produced significantly the lowest yield (0.30 kg/plot). There was no interaction effect of locations and varieties on marketable bulb yield.

3.7. Marketable bulb yield (t/ha) in two locations

The marketable bulb yield was higher (15.96 t/ha) in Chitwan compared to Nawalparasi (14.66 mt/ha) (Table 2). Although, there was no significant effect of levels of nitrogen on marketable bulb, the yield was highest (16.66 t/ha) at 120 kg N/ha where as it was lowest (14.33 t/ha) at 40 kg N/ha. Agrifound Dark Red produced significantly highest yield (25.22 t/ha) while Dadeldhura Local yielded lowest (1.11 t/ha). N-53 produced 19.70 t/ha. Although, there was no interaction effect of locations and varieties on marketable bulb yield, Agrifound Dark Red produced the highest yield (26.22 t/ha) and Dadeldhura local the lowest (1.11 t/ha) in Chitwan.

The result contradicted with the result of Gautam et al., 2006 who reported that the marketable bulb yield of N-53 was 16.63 t/ha. The difference may have been contributed by the environmental difference of the locations. The higher yield in the present study may have been due to suitability of N-53 in the Terai condition. The similar result (20.83 t/ha) of N-53 was observed by Katwale and Bisen (1986). The yield of summer stress tolerant varieties ranged from 15 to 25.9 t/ha (AVRDC, 1994).

Non significant effect of nitrogen on the yield as found in the present study is in agreement with the findings of Singh et al. (1972) who reported non-significant difference in yield when level of nitrogen was increased from 56 kg/ha to 168 kg/ha. They conducted the experiment in Hariyana Agriculture University, Hissar, India during 1969 – 1970. The variety was Punjab Selection and the soil type was sandy loam. In the present study, the yield increased with the increased doses of nitrogen but there was no significant difference.

The rainfall was higher during September in Chitwan whereas it was higher during July in Nawalparsi. In Chitwan condition, rainfall during September fulfilled water demand of crop which might have increased the biological, bulb as well as marketable bulb yield in Chitwan than in Nawalparsi. As per soil test, the organic matter and nitrogen content were higher in Chitwan than in Nawalparasi. So far as potash status is concerned, it was high in Chitwan soil but medium in Nawalparasi soil with exception of plot no.1.

3.8. Economic Analysis of off-season onion production

Total cost of production, gross income, net return and benefit cost ratio (B:C) of Agrifound Dark Red (AFDR) and N-53 have been calculated (Table 3). Total production cost included cost of seedling production and cost of production of onion bulb. The production cost of seedling varied with the variety as the seed cost varied much depending upon the variety. The cost of production of onion bulb varied with the levels of nitrogen. Net return varied with the yield.

In Chitwan, at 120 kg/h N application, Agrifound Dark Red gave higher gross income (Rs.4, 97,502.00 per ha.) than N-53 (Rs. 3, 90,942.00 per ha.). Similarly, the net return of AFDR (NRs. 3,34,710.00 per ha.) was higher than that of N-53 (NRs. 2,32,822.58 per ha.).

In Nawalparasi, at 120 kg/h N application, the gross income of Agrifound Dark Red was Rs.4, 74,858.00 per ha where as N-53 was Rs. 3, 83,616.00 per ha. Similarly, AFDR gave higher net return of NRs.3,12,066.50 per ha. than N-53 (NRs. 2,54,496.58 per ha.).

The B:C ratio of AFDR was higher than that of N-53 in both the districts (Table 3), the highest being 3.06 in Chitwan.

Table 1. Plant stand, bolted plants and doubled bulbs of different onion varieties at different levels of nitrogen in two locations during 2007/08

Treatments	Plant stands	Bolted plants	Double bulbs
Location	(%)	(%)	(%)
Nawalparasi (Loc1)	71.33a	1.38a ((0.457)*	22.97a (1.225)*
Chitwan (Loc2)	50.63b	0.75b (0.414)*	27.08b (1.415)*
S E_m	1.375	0.0207	0.040
LSD	4.23	0.0200	0.115
Nitrogen (kg/ha)			
40	60.95	0.79(0.411)*	24.79(1.319)*
80	61.83	1.20(0.443)*	24.25(1.272)*
120	60.16	1.20(0.452)*	26.04(1.369)*
S E_m	1.89	0.0254	0.0491
LSD	ns	ns	ns
Variety			
AFDR	68.75a	2.00a (0.539)*	18.62b (1.197)*
N-53	62.08b	1.00a (0.465)*	17.70b (1.193)*
DL	52.12c	0.00b (0.301)*	38.75a (1.156)*
S E_m	1.89	0.0355	0.0482
LSD	5.44	0.089	0.029
Location and Variety			
Loc1 and AFDR	80.66	2.75(0.598)*	10.91(0.978)*
Loc1 and N-53	72.83	1.41(0.470)*	13.08(1.060)*
Loc1 and DL	60.50	0.00(0.301)*	44.91(1.637)*
Loc2 and AFDR	56.83	1.25(0.480)*	26.33(1.417)*
Loc2 and N-53	51.33	1.00(0.460)*	22.33(1.327)*
Loc2 and DL	43.75	0.00(0.301)*	32.58(1.502)*
Mean	60.98	0.435	1.320
S E_m	0.082	0.0503	0.0681
LSD	ns	ns	ns
CV%	15.24	40.01	17.87

In column figures bearing same letter do not differ significantly at 5% DMRT.

* Data of bolted plants (%) and double bulb (%) were log transformed (parenthesis) and analyzed.

Table 2. Biological yield (kg/plot), bulb yield (kg/plot) and marketable yield (kg/plot) of different varieties of onion at different levels of nitrogen in two different locations during 2007/08

Treatments Location	Biological yield (kg/plot)	Bulb Yield (kg/plot)	Marketable bulb yield (kg/plot)	Marketable bulb yield (mt/ha)
Nawalparasi (Loc1)	7.75a	4.76b	3.96	14.66
Chitwan(Loc2)	9.80b	5.48a	4.31	15.96
S E_m	0.25	0.13	0.127	0.47
LSD	0.79	0.13	ns	ns
Nitrogen (kg/ha)				
40	8.37	4.81	3.87	14.33
80	8.59	5.05	4.04	14.96
120	9.35	5.50	4.50	16.66
S E_m	0.317	0.16	0.155	0.57
LSD	ns	ns	ns	ns
Variety				
AFDR	10.62a	7.25a	6.81a	25.22a
N-53	9.52b	5.81b	5.32b	19.70b
DL	6.17c	2.30c	0.30c	1.11c
S E_m	0.360	0.28	0.344	1.25
LSD	1.03	0.82	0.987	3.65
Location and Variety				
Loc1 and AFDR	9.83	6.94	6.53	24.18
Loc1 and N-53	8.01	5.47	5.04	18.66
Loc1 and DL	5.40	1.88	0.31	1.14
Loc2 and AFDR	11.42	7.56	7.08	26.22
Loc2 and N-53	11.04	6.16	5.55	20.55
Loc2 and DL	6.95	2.72	0.300	1.11

Mean	8.77	5.126	4.14	15.33
S E_m	0.509	0.405	0.486	1.8
LSD	ns	ns	ns	ns
CV%	20.09	27.40	40.73	40.73

In column figures bearing same letter do not differ significantly at 5% DMRT.

Table 3. Gross and net return and B:C ratio of off season onion production at two districts (NRs./ha.)

SN	Description	Total cost	Gross income	B:C ratio	Net return
1	AFDR at 120 kg N/ha in Chitwan	1,62,791.50	4,97,502.00	3.06	3,34,710.00
2	N-53 at 120 N/ha in Chitwan	1,58,119.42	3,90,942.00	2.47	2,32,822.58
3	AFDR at 120 kg N/ha in Nawalparasi	1,62,791.50	4,74,858.00	2.92	3,12,066.50
4	N-53 at 120 N/ha in Nawalparasi	1,58,119.42	3,83,616.00	2.43	2,54,496.58

4.

5. Conclusion and implication

Comparatively, Agrifound Dark Red performed better in yield in both the districts whereas Dadeldhura Local performed the least. Agrifound Dark Red can be suggested as off season variety. N-53 was second in bulb yield after Agrifound Dark Red. B:C ratio of Agrifound Dark Red at 120 kg N/ha was the highest in both district.

6. Acknowledgement

The authors are highly thankful to National Agriculture Research and Development Fund (NARDF) for the financial support.

7. References

Acharya, D. 2007. Evaluation of onion (*Allium cepa* L.) landraces in Rampur, Chitwan, Nepal. Thesis, M. Sc. Institute of Agriculture and Animal Science, Rampur, Nepal.

APROSC. 1995. Agriculture Perspective Plan, Agricultural Project Services Center/ John Millar Associate Inc. Washington.

AVRDC. 1994. Evaluation for onion yield performance during different seasons. AVRDC publication. pp. 95-434.

Budathoki, K. 2006. Market Oriented Organic and Off-season Vegetable Production Technology. Basanti Budathoki (Ed.). pp. 215-227.

Gautam, I. P., B. Khatri and G. P. Poudel. 2006. Evaluation of different varieties and their transplanting times for off-season onion production in Mid Hills of Nepal.

Submitted to Society of Agriculture Scientist, Kathmandu (Unpublished).
Gautam, T. 2007. BAJAR CHHA PYAJ KHETI GARAUN. Himal 2-15 December, 2007. Kathmandu 17 (16): 54.
Katwale, T. R. and A. L. Bisen. 1986. Influence of different dates of transplanting of *Kharif* onion (*Allium cepa* L.) Vegetable Science 13(1):79-82.
Mintistry of Agriculture and Cooperative (MoAC). 2006. Statistical Information on Nepalese Agriculture, 2005/2006. Agri-Business Promotion and Statistics Division. Singh Darbar, Kathmandu, Nepal.
Mohanty, B. K. and A. M. Prutsi. 2002. Varietal screening of onion for *Kharif* cultivation. O.U.A. and T. Regional Research Station, Bhawanipatna-766 001 (Orissa), India, pp. 145-148.
Pathak, C.P. 1994. Allium Improvement for the Tropics: Problems and AVRDC Strategy. In D. J. Midmore (ed.) Acta Horticulture. International Symposium on Alliums for the Tropics, Bangkok, Chiangmai, Thailand, 15-19 February 1993. Asian Regional Center AVRDC.
REPUBLICA. 2009. Onion remains costly despite government campaign. Available: www. REPUBLICA. com. Retrieved: February 15, 2009.
Rokaya, B. B. and K. B. Bhandari. 2004. Study on off-season onion production in river basin environment of Mid and Far Western Region of Nepal. Advances of Horticultural Proceeding in Nepal. Nepal Agricultural Research Council, National Agricultural Research Institute and Horticultural Research Division, Khumaltar Lalitpur. pp. 367-372.
Singh, B., Y. S. Babel, B. D. Yadav and D. R. Sharma. 1995. Effect of size of onion sets and planting distance on yield and economics of *Kharifs* onion. Indian Journal of Horticulture 52(3):215-217.
Srivastava, A. and M. D. Sharma. 1993. Suitability of locally available containers for the storage of onion bulb. IAAS, Research Report. pp. 73-75.
Vegetable Development Directorate (VDD). 2007. Annual Progress Report. Khumaltar, Lalitpur.