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**Himalayan College of Agricultural Sciences and Technology (HICAST)**

*Purbanchal University affiliate*

**Kalanki, Kirtipur-1, Kathmandu, Nepal**

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B.SC. (HONS.) AGRICULTURE**

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## FOREWORD

Himalayan College of Agricultural Sciences and Technology (HICAST) has been conducting academic programs in affiliation with Purbanchal University since 2000. Both the bachelor and master degree students must conduct field- and/or laboratory-based research, write and submit theses based on research findings as a partial requirement for obtaining the degree the student is enrolled to. Without being properly and timely published, these research findings cannot reach to a wider readership, and continue to remain as decorative materials in the bookshelves of the library. Realizing the importance of widely circulating at least the abstracts of those researches, an attempt was initiated by us to publish the thesis research abstracts annually.

This publication is a collection of abstracts of eighty five theses researches conducted in 2018-2019. This is the ninth volume of this journal. Relevant thesis can be conducted at HICAST Library for more information.

This publication has seven chapters, viz. crop science and horticulture, plant protection, soil science, plant breeding, agri-economics and business management, and sustainable agriculture and climate change. This division is based on the departments the papers fall within.

I would like to acknowledge all the organizations (GOs, INGOs, Private Organizations) and HICAST for providing financial as well as other support to the intern students for conducting these researches in various parts of the country. I would also like to thank all graduates of HICAST who sincerely and successfully accomplished their research responsibilities. I also acknowledge all the faculties and scientists who supervised HICAST students to conduct these researches.

It is hoped that the publication will be useful for the students, researchers, teachers, policymakers, and development workers. It is the publication that each student of agriculture and veterinary science should possess and read.



1 December, 2019

Binayak P Rajbhandari, Ph.D  
Executive Chairperson

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# **AGRI-ECONOMICS & BUSINESS MANAGEMENT**

## **STUDY ON TRANSITION FROM EXPORT TO IMPORT OF RICE IN NEPAL**

**Aastha Pudasainee**  
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This study is about export and import situation of rice in Nepal. The duration of the study was from June 3rd to August 2nd, 2018. This study tries to address the issues of rice import through formal and informal channels in the country. Despite huge government efforts in increasing rice production in the country, import is in increasing trend. Twenty rice suppliers, wholesalers, and mills of Kathmandu, Lalitpur and Kavrepalanchok Districts were surveyed to determine the demand for rice according to grain types. Data were also taken into account and analyzed from secondary sources that include directories of Trade and Export Promotion Centre, Central Bureau of statistics and other published resources. Nepal used to export rice to several countries at around 1970s and after that, the scenario has been found significantly changed. The population and import of rice in Nepal are found strongly and positively related with each other ( $R=0.998$ ,  $P=0.04<0.05$ ). Similarly the urbanization, labor out-migration, internal migration and import of rice in Nepal has been found significantly and correlated positively with each other ( $R=0.885$ ,  $P=0.002<0.01$ ), ( $R= .886$ ,  $P= .019<0.05$ ) and ( $R= .981$ ,  $P= .003<0.01$ ) respectively. Due to increasing population, urbanization, internal migration, migration of people to other countries for labor, change in food habit, excessive rice intake than recommended, preference of fine aromatic rice by consumers, the comparatively cheaper price of Indian rice and post-harvest utilization, consumptions and modifications, rice imports have been increasing. These are the main drivers of increasing rice imports in Nepal.

**Keywords:** *export, fine aromatic, production, grain type, import*

## **PROBLEM AND POTENTIALITY OF GINGER MARKETING IN SALYAN DISTRICT**

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This study is about the assessment of the knowledge, problems, potentiality and management of market followed by farmers and traders in 15<sup>th</sup> August to 25<sup>th</sup> October in Salyan District. A total 60 samples including 40 farmers and 20 traders were interviewed using semi-structured questionnaires. The survey was conducted in the ginger grown area and market of Dadagaun VDC, Tharmare VDC and Kapurkot rural municipalities of Salyan District. This study was focused on evaluating the marketing system of ginger as well as its problems and potentiality within Salyan District. The benefit cost ratio of ginger production was 1.89 showing ginger production enterprises as profitable business within study area. Farmers along with traders were found to be suffering from different production and marketing constraints. Both men and women have been found contributing at different sectors for production and marketing of ginger. Men generally perform heavy physical works like tillage activities which require intense physical labour force while women are involved in tedious and time-consuming work such as plantation, weeding and harvesting. Both male and female members in the households were found to have access to resources and opportunities in terms of social, economic, material and so on. There should be efforts from government level to eradicate those problems associated with production and marketing in the pocket area of ginger production. Government should help to upgrade ginger farming and market promotions internally and internationally.

**Keywords:** *marketing, production, constraints, ginger, farming*

## **AGRO-TOURISM AS AN ALTERNATIVE AGRO-ENTERPRISE: A CASE STUDY IN MULKHARKA VILLAGE, KATHMANDU**

**Astha Ghimire**  
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The case-study was carried out to assess agro-tourism as an alternative agro-enterprise in Mulkharka village which is situated in the outskirts of Kathmandu district from 16th to 18th November, 2018. Both qualitative and quantitative survey methods were chosen using interviews and questionnaires respectively. The interviews were held with 15 agro-tourism enterprise operators, 29 tourists and a focal group discussion with 7 people as respondents. The

village is located at the heart of the Shivapuri-Nagarjun National Park. This traditionally built village of about 125 families was found principally engaged in agriculture cultivating crops like millet, barley, wheat on their meager land holding. The resident wildlife does pose a problem as crop matures but not insurmountable. Hotels, lodges and home-stay were found offering accommodations to tourists and serving home cooked foods. The village was found to be a great place for trekkers to stop for lunch en-route to Chisapani, Langtang and Helambu or a good place for a weekend or leisure hiking trip from Kathmandu. The agro-tourism operation in the area has helped the locals utilize the natural resources, attractions, general life patterns and culture of the area and simultaneously generating additional income as well as uplifting the status of village. The introduction, development and promotion of agro-tourism can play a major role in uplifting the economic status of the farmers throughout various parts of the country as well.

***Key-words: agro-tourism, problems, alternative agro- enterprise, SWOT analysis***

### **STUDY ON MARKETING OF APPLE IN KALIKOT DISTRICT**

**Bhumika Pokharel**  
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The study on marketing of apple in Kalikot district was conducted from July to December 2018. The survey was conducted on 40 apple producers, 10 wholesalers, 20 retailers and 30 consumers with all together 100 respondents. The marketing system was found purely private based system dominated by pre-harvested contractors. The findings showed that both local and non-local pre-harvest contractors were involved in the marketing system of apple. The producers were facing several production related problems, such as diseases, insects, lack of irrigation facilities, and lack of technical know-how. Farmers were also facing other marketing problems, such as low price of product, lack of transportation facilities, problem in selling, unorganized nature of market, monopoly of contractor and lack of storage and processing facilities. It was revealed that there were no grading and storage systems adopted by producers. To enhance production and marketing efficiency, the policy recommendations are being made focusing on both problems and high potentials of apple in the study area.

***Key words: apple, marketing channels, pre-harvest, Kalikot, policy***

### **SOCIO-ECONOMIC ANALYSIS OF SMALLHOLDER GOAT ENTERPRISE OF GULMI DISTRICT**

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The present study on socio-economic analysis of smallholder goat enterprise of Gulmi district was undertaken in three rural municipalities. One hundred smallholder farmers rearing goat of Dhurkot, Malika and Isma rural municipality in Gulmi district were surveyed. This study tried to address the benefit and cost of goat enterprise of smallholder farmers and marketing channel of goat in Gulmi district. The study helped in the identification of goat breeds for competitive marketing enhancing export marketing channel. Cost of production, return from the product, and profit from the product and benefit cost (B/C) ratio were taken as profit accountability variables. The goat rearing enterprise in the study area made a significant contribution to the economic welfare of the sample respondents.

***Key words: socio-economic analysis, small-holder goat enterprise, marketing channel***

### **STUDY ON THE ECONOMIC PERFORMANCE OF ROOFTOP GARDENERS IN KATHMANDU DISTRICT**

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Rooftop gardening is the technique of cultivating different fresh green vegetables, and fruits on the top of building mainly in urban areas. Roof top farming is done usually by using hydroponics, geponics, green roof, or container gardens. A study was conducted to know the economic performance of rooftop farmers in 3 municipalities of Kathmandu district namely Kirtipur, Chandragiri and Tarkeshwor during August to September 2018 in Nepal. For this study, 60 households with rooftop garden were surveyed, out of which 20 were from Chandragiri municipality, 30 from Tarkeshower municipality and 10 were from Kiritipur municipality. The primary data were collected from the direct garden survey of rooftop growers. The information provided by rooftop growers was the primary source of information. The study showed that the total cost of production of different vegetables per roof is about NRs. 10055 per year. The total revenue produced in current market price was found to be NRs. 14250 per year per roof. The net profit from rooftop farming was found to be NRs.4195 per year. The study also showed that the benefit cost ratio was 1.39 per annum.

**Key words:** *rooftop gardening, urban farming, B: C ratio, Kathmandu*

### **VALUE CHAIN ANALYSIS OF ROSE FLOWER IN KATHMANDU VALLEY**

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Value chain approach is an important tool to maximize profitability through value share, mutual benefits and consumer satisfaction in flower business. The main objectives of this study were to assess the value chain of rose cut flower in Kathmandu valley of Nepal. Household survey was conducted from July to September, 2018. Thirty respondents including producers, wholesalers and retailers from Bhaktapur, Lalitpur and Kathmandu were selected and interviewed. Average area under rose cultivation, average cost of cultivation and average cost of production was found to be 6.91 ropani, NRs. 280148.9 per ropani and NRs. 7.27 per stick respectively. Average gross return from rose cut flower was NRs. 372,799.22 per ropani per year. Total cost including losses, storage, transportation, grading and packaging of rose in value chain to a producer, wholesaler and retailer was NRs. 8.82, NRs. 11.53 and NRs. 15.21 per stick respectively. On an average profit margin to producer was NRs. 2.37 per stick followed by retailer NRs. 2.08 per stick and wholesaler NRs. 1.08 per stick. The highest level of value addition was at producers' level followed by retailers among several stakeholders in rose value chain. Governmental organization, I/NGOs, FAN, AEC, Banks and farmers' group were identified as supporting and enabling farmers and other stakeholders in the value chain of rose cut flower. Input suppliers, wholesalers, producers, retailers, importers and exporters were found as major actors. For agri-business promotions including floriculture with extension and management regulations, the government should develop policies for the further promotion of value chain in rose business.

**Keywords:** *flower, rose, Kathmandu, value chain, analysis*

### **ECONOMICS OF MANDARIN PRODUCTION IN KUSHE RURAL MUNICIPALITY OF JAJARKOT DISTRICT**

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A study was carried out to analyze the financial viability of mandarin production in Kushe Rural Municipality of Jajarkot district. A total of 80 respondents was selected through random sampling method. Primary data was collected through household survey through questionnaire and other relevant information were taken as secondary sources. The SPSS and Ms Excel software tools were used to analyze the data. The cost of production, gross margin, internal rate of return, benefit cost (B:C) ratio, payback period were known from the study. The B:C ratio was found to be 1:55, while the net present worth at 12 percent discount was found to be Rs. 1,11,702, and internal rate of return was found to be 26%. The payback period of capital investment for mandarin orange has been estimated to be 7.9 years within the economic life of 20 years. The results showed that mandarin production is a financially viable agri-business. The cost of production of 1 kg mandarin orange was Rs. 15,326 for 5-12 years.

**Key words:** *mandarin, orange, economic, payback, agri-business, viability*

## **ASSESSMENT OF GOVERNMENT INTERVENTION IN MILK PRODUCTION: A CASE STUDY OF KATHMANDU VALLEY**

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A case study on assessment of government's intervention in milk production in Kathmandu valley was carried out during August to December 2018. The main objective was to assess the impact of government programs and policies on dairy sector. Ninety farmers were randomly selected from different areas of Kathmandu valley and were interviewed with the help of semi-structured questionnaires. The primary information indicated that male farmer respondents were higher as compared to female respondents. Majority of the respondents fell under the age group of more than 50 years and most of the respondents were illiterate. Most of respondents had land holding of 0-0.26 hectare mostly rented/leased. Only 16 percent of respondents had taken training from different institutions like CTEVT, NGOs, INGOs. Majority of respondents didn't have any idea about government programs, projects and policies. Only 23.33 percent of respondents got support from the government. About 66.7 percent respondents didn't get any technical services from the government. Ninety nine percent of respondents were not satisfied with the livestock development projects. About 83.33 percent know about insurance scheme and 66.67 percent respondents have done insurance of their cattle and buffalo. Only 43.33 percent of the respondents had registered their farms.

**Key words:** *cattle and buffalo, government policies, programs and projects*

## **STUDY ON STATUS OF AGRICULTURE INSURANCE IN NEPAL**

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A study was conducted to know about the agriculture insurance plan and policies in three districts Kathmandu, Lalitpur and Bhaktapur districts during September-October 2018. The primary information was collected through simple random survey with 100 households from different villages of three districts. Out of 100 respondents, 59% were found to be male and 42% were found to be female. Majority of respondents fell on the age group of 40-50 and most of the respondents belonged to Brahmin group. The major sources of information were technical person (57%), agent (21%), agriculture service center (13%), media (6%) and their relatives (3%). The study revealed that 56% of population hadn't studied those terms and conditions of insurance policy before doing insurance while 44% had studied all terms and conditions. Agriculture was the major source of income for 82% of respondents followed by business (9%), foreign employment, (6%), and service (3%). Fifty six percent of the respondents had done their non-life insurance in NLG, 44% in Asur non-life insurance, 4% in Himalayan General Insurance Company and 1% in National Insurance Company. Livestock insurance was found higher than crop insurance. Out of the total 50% had done insurance of only cow, 15% had done insurance of buffalo, 20% had done insurance of both cow and buffalo, 14% of tomato and 1% of cabbage. About 96% of the respondents were highly satisfied with insurance services. The study found out that there were only 17% claims in a year. During a small group discussion with 35 farmers, when they were asked about the major reason for not doing insurance, majority of people replied that they had no idea about insurance (64%), complex documentation (24%), 4% had no return of payment and 8% had no faith in scheme /agency.

**Keywords:** *insurance, agriculture, livestock, claim, status*

## **EFFECTIVENESS OF GRANTS SUPPORT IN OFF-SEASON VEGETABLE PRODUCTION IN SURKHET DISTRICT**

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A study was carried out from July to August 2018 to assess the effectiveness of grants support in off-season vegetable (OSV) production followed by individual farmer, farmers group, and traders in Surkhet District. The study was conducted among the beneficiaries supported by the High Value Agriculture Project (HVAP) in Birendranagar municipality, Panchapuri municipality and Gurbakot municipality of Surkhet district. A total of 128 respondents, 25 farmers from Birendranagar municipality, 23 farmers from Gurbakot municipality and 80 farmers from Panchapuri municipality were selected for the study. The amount of grant support from HVAP in different farmers group of study area was found to be NRs.10,103,487 through Sector Development Fund, Value Chain Fund Window, Production and Post-harvest Fund, and Poverty Inclusion Fund. After providing different types of funds to the beneficiaries, the area of OSV production increased by 154.08 ropani, production of OVS increased by 39283 kg, post-harvest loss decreased by 4.73% and average net income per household increased by NRs.46, 807.58. Similarly, in comparison to female less number of male farmers and traders were involved in off-season vegetable production and marketing and more number of Brahmin/chettri, janjatis and dalit were found among farmers group. The number of households who faced hungry season more than 6 months was decreased by 48% and food sufficiency increased up to nine month and up to whole year also increased by 38% and 10%. Off-season vegetable farming is economically sound and profitable enterprises in study area.

*Key words: off-season vegetable, grants, fund and facilities, effectiveness*

## **VALUE CHAIN ANALYSIS OF STRAWBERRY IN NUWAKOT DISTRICT**

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A study was done on value chain of strawberry farming in Nuwakot district in September 2018. A hundred farmers along with 5 wholesalers and 5 retailers as respondents were randomly selected from Tarkeshwor municipality and Kakani municipality. In the survey male respondents were higher in numbers as compared to female. Majority of the respondents were under the age group of 46-60 and most of them belonged to ethnic groups, also known as Janjati. The study shows that the strawberry cultivation was a profitable farming in the study area. The average cost of production of strawberry was found to be NRs 104/kg whereas the sales price was NRs 250/kg. The average Benefit-Cost (B/C) ratio was found to be 2.4. The average cost of strawberry cultivation per ropani per year was estimated to be NRs 1,19,975 whereas return was NRs 2,87,500/ropani/year. Along the strawberry market flow chain, the margin of wholesalers and retailers were Rs. 53 and Rs. 34/kg respectively. The share in total benefit was found to be highest of farmers (56.28%) followed by wholesaler (26.63%) and retailer (17.08%). Strawberry producers, collectors, wholesalers and retailers were the major actors of strawberry agri-business in Nuwakot. Farmers started strawberry cultivation due to good market and high price whereas disease/pest was the major problem in production. Unavailability of processing plants and proper storage facility were the major weaknesses in the strawberry value chain.

*Keywords: strawberry, value chain, market, cost, profit, Nuwakot*

## **ECONOMIC ANALYSIS OF TOMATO CULTIVATION UNDER PLASTIC TUNNEL HOUSE IN TARKESHOR MUNICIPALITY, KATHMANDU DISTRICT, NEPAL**

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A study on economic analysis of tomato cultivation under plastic tunnel in Tarkeshor Municipality, Kathmandu District was conducted from June to December 2018. A total of 80 respondent farmers were selected and interviewed by using semi-structured questionnaire. Tomato was one of the most important high value income crops in the study area. Majority of the tomato farmers in the study area were found to be small and marginal farmers. It was found that the average cost of production per ropani was NRs.115902, the gross margin was NRs.235,509 and the net profit from business was NRs. 138000. The average tomato production ropani/year was estimated to be 7694 kg and the benefit cost ratio was 2.20. Economic analysis showed that tomato production was a highly beneficial

enterprise. In the marketing system, the channel of producer-village traders-wholesaler-retailer- consumer was most common where about 43.75% tomato passes to consumer through this channel. Likewise, telephone, neighbors and friends were the major means of market information for majority of respondents. Average family size was found to be 5 members with land holding size of 4 ropani. Market price of tomato was higher in September and October. It was found that requirement of more labours, higher occurrence of diseases and pests, higher initial cost, higher price of agri-inputs, lower price during harvesting period, fluctuation in market prices, lack of appropriate markets, were major problems in the tomato in the study area. The government and concerned agencies are suggested to provide support needed to overcome these problems.

**Key words:** *tomato, plastic tunnel, benefit cost ratio, gross margin, marketing*

## **SUPPLY CHAIN ANALYSIS OF ORGANIC AGRICULTURE PRODUCT IN KATHMANDU VALLEY**

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A study on supply chain analysis of organic agriculture product in Kathmandu valley was carried out from July to December 2018 to know the marketing margin, marketing channel and marketing constraints. The Kathmandu valley was selected as study site because the organic producer, organic consumer, organic shop and organic farms are more in Kathmandu valley than other cities of Nepal. The consumers were found willing to pay extra price for organic products compared to non-certified organic products. Altogether 125 respondents including 80 consumers, 30 producers and 15 retailers were randomly selected and interviewed through the prepared questionnaire. The data obtained were analyzed using MS Excel to calculate mean, frequency and percentage. The finding of the study revealed that gender, income, family size, education, profession, residences and knowledge about organic products are key attributes of the consumers shaping their decision to buy organic products. Organic vegetables were either home delivered and/or sold to the specialized niche markets. All domestic organic products reach to consumers without labeling of certification but the consumers preferred to buy certified organic products. The organic consumers were found willing to pay an average of 21.86 percent for certified organic product. The survey also suggested that the consumption of organic product is increasing. However, product development and innovations in certification, processing, labeling and packaging were found to be needed to further stimulate demand.

**Key words:** *consumer awareness, organic products, certification, marketing, willingness to pay*

## **VALUE CHAIN ANALYSIS OF NEPALI HOG PLUM (LAPSI) IN KATHMANDU DISTRICT OF NEPAL**

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A study on value chain analysis of Nepali hog plum in Kathmandu Valley was conducted during August to September 2018 to understand the value added process as well as its contribution to the actor's income. Primary and secondary data were collected from forty farmers. The actors of value chain of Lapsi were input suppliers, farmers, transformers, retailers and the final consumers. Due to lack of strong coordination between different actors of supply and value chain, information about the price spread, processing, marketing were not still in the hands of the farmers and consumers. The farmers surveyed were smallholders with an average production of 300 Kg per tree. In the value chain, the farmers were the stakeholders who made the highest profit which can be explained by the channel "Farmers to consumer". Challenges were identified as unavailability of quality saplings, insufficient finances to expand production, and market instability. Lapsi production was found to be very lucrative at the study area and it was a tool for food security. There is a need for a value chain (VC) approach as a means to address weaknesses currently seen in Lapsi marketing channel and the subsequent value addition along the channel.

**Keywords:** *value chain, input suppliers, consumers, Nepali hog plum, lucrative.*

## **A STUDY ON PREVALING SITUATION OF CATTLE FARMING AND MILK SUPPLY SCHEME IN KATHMANDU VALLEY**



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A survey was conducted on prevailing situation of cattle farming and milk supply scheme from September to November 2018 at Kathmandu Valley. The main objective of the study was to observe the market of the DDC and the general milk production of the Kathmandu valley. For the study, 75 cattle herders, 15 DDC booths, 60 DDC milk consumers were selected from three districts Bhaktapur, Kathmandu and Lalitpur. The data were collected, entered and analyzed in MS-Excel. The average milk production by cattle was found to be 12.84 litres/day while the average milk production from a cattle herd was found to be 124.38 litres/day. Ninety five percent of the respondents have been found adopting the artificial insemination for breeding of cattle herd. The average amount of concentrate feed received by cattle in the valley was 7.62 kg/day. Similarly farmers earned NRs.81.60 /liter of milk. From coming to the year 2072/73 to 2073/74 the collection of the milk of DDC decreased by 11.65%, whereas milk sale decreased by 5.16%. From 2074/75 to 2073/74 the volume of the collected milk decreased by 8.68%, whereas the milk sale decreased by 9.26% .DDC was on top position in the market with the annual sales of more than 3 crore liters followed by other private dairies. Majority of consumers (65%) were sure that in the upcoming future they would continue to consume the DDC milk whereas 35% were not sure that they would continue to consume the DDC milk. Those who were regular consumers of DDC milk were asked about the choice of DDC milk and direct supplied Farm milk, and about 96.66% of regular DDC consumer preferred farm milk rather than DDC milk. The consumers were consuming DDC milk because they did not have easy access to the Farm produced milk.

**Keywords:** *cattle, milk supply, Kathmandu, farming, situation*

#### **RETROSPECTION AND PROSPECTS OF SUBSIDIZED CHEMICAL FERTILIZER MARKETING IN KATHMANDU VALLEY**

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A study on retrospection and prospects of subsidized chemical fertilizer marketing in Kathmandu Valley was carried out during September-November 2018. The random sampling method was used for selection of respondents and sample size was 130. Both quantitative and qualitative data were collected via semi-structured questionnaires from Ministry of Agriculture and Livestock Development, Agricultural Inputs Company Ltd. (AICL), Salt Trading Corporation Ltd. (STCL), farmers, dealers and other key informants purposively for the study. The result showed that the overall sale trend of chemical fertilizer in Nepal from year 2070/71 to 2074/75 is in increasing trend with an annual growth rate of 17.09 %. At the same time, the study reported that price of urea fertilizer was much lesser than DAP and MOP. Farmers were found using urea in high quantity rather than balanced use of nutrients leading to nutrient imbalance in the soil. The major fertilizer market in Nepal was found to be dominated by AICL & STCL. The distribution system of fertilizer in Nepal is controlled and channelized. The trend of fertilizer price was in increasing even after the reintroduction of fertilizer subsidy. The selling price fixed by government at Point of Entry were Rs 14,000, 43,000 and 31,000/MT of Urea, DAP and MOP respectively but farmers have been purchasing them at an average of Rs 21,300, Rs 48,700 and Rs 37,200/MT respectively. At present, cooperatives are playing major role in fertilizer distribution. Fertilizer shortage during main cropping season was the major problem among farmers in Nepal due to insufficient supply, inadequate storage facilities, fluctuation in purchase price by farmers even after subsidy scheme, black market, urban area centered fertilizer marketing, and absence of chemical fertilizer plant in Nepal.

**Keywords:** *chemical fertilizer, fertilizer, subsidy, retrospect, prospects*

#### **ECONOMIC ASSESSMENT OF ADVISORY SERVICES THROUGH PLANT CLINIC IN KAVREPALANCHOK AND RUPANDEHI DISTRICT OF NEPAL**

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A study was carried out from July to December 2018 to know about economic assessment of advisory service provided by plant clinic in the study area. This survey was done with semi-structured questionnaires to targeted groups. Fifty farmers each from both categories (clinic and non-clinic) from both districts, with all together 200 samples were randomly selected and surveyed. It revealed that more number of male farmers (68%) was found involved in plant clinic as compared to female (32%). The difference in the level of education of farmers and their participation in clinic was found at 5% ( $p < 0.05$ ) level of significance. The difference in cultivated land holding size of farmers and their participation in plant clinic was found statistically insignificant. The access and coverage of plant clinic was better in Kavrepalanchowk than in Rupandehi. Farmer's perception toward plant clinic was very positive and the average percentage of recommendation adopted by farmers was 84% and 85% in Rupandehi and Kavrepalamchowk respectively. There was huge fall (by 49.7%) in the cost of pesticide expenditure before (Rs 37,320) and after (Rs 18,550) adoption of clinic recommendation and this difference was statistically significant at 1% ( $p < 0.01$ ) level of significance. The benefit cost (B:C) ratio of farmers after attending plant clinic was 3.176 whereas the previous was 2.23 and this difference was at 1% ( $p < 0.01$ ) level of significance. The B:C ratio of non-clinic farmer was less (2.18) than clinic farmers (3.176) and this difference was at 1% ( $p < 0.01$ ) level of significance.

**Key words:** *plant clinic, economic assessment, B: C ratio, advisory services, Rupandehi*

## VALUE CHAIN ANALYSIS OF OYSTER MUSHROOM IN KATHMANDU DISTRICT OF NEPAL

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A study was carried out from August to November 2018 to analyze value chain and marketing status of oyster mushroom in the study areas. Surveys were conducted at producers, traders and consumers level to collect the primary information through semi-structured questionnaires. Forty six respondents were selected randomly for the survey. Farmers were found playing an important role in this value chain and were at the forefront of mushroom production. The fruit and vegetable markets of Kalimati and Balkhu and some local grocery stores were found to be places of oyster mushroom sales for farmers and wholesale suppliers. The selling price of oyster mushroom per kg was NRs. 150 (farmers to wholesalers) and average yield per substrate bag was 3.5 kg. The benefit cost ratio of oyster mushroom was 2.57 with cost of production, NRs. 81492.4 per tunnel and the gross return from the oyster mushroom was NRs. 211500.

**Key words:** *oyster mushroom, production, traders, consumers, marketing, benefit cost ratio.*

## STATUS OF DAIRY DEVELOPMENT CORPORATION IN MARKETING OF MILK AND MILK PRODUCTS

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A study was conducted to find out the status of Dairy Development Corporation (DDC), Nepal. The study was conducted in the capital city Kathmandu where most of the information was collected from the DDC Central Office, Lainchour. For other related information 20 retailers and 20 dealers of milk and milk products and 20 consumers were selected for purposive study. The result showed that the corporation had set abundance of objectives in order to fulfill the growing demand of the dairy products in the country. In the last three years the expenditure of the corporation was in increasing trend whereas the revenue collection was in decreasing trend. Further the study highlighted various channels involved in the marketing of dairy products from farm to the ultimate consumers. The major constraint for the marketing of milk and milk products was the lack of ability of dairy co-operatives in collection of maximum quantity of milk due to which low production and distribution was witnessed. The low production resulted less income due to which the corporation did not separate sufficient budget for the maintenance and development of infrastructure. Hence, the DDC should focus on improving infrastructure and should produce diversified quality products so that the domestic products can substitute the foreign imports.

**Keywords:** *marketing of milk, milk products, business growth, DDC, constraints*

# **HORTICULTURE**

## **STUDY ON POST HARVEST LOSSES OF BANANA DURING MARKETING CHANNEL IN CHITWAN DISTRICT**

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A study on post harvest losses of banana during marketing channel was conducted from August to October 2018. About 100 respondents were selected randomly for primary data and information collection (40 farmers, 20 wholesalers, 20 retailers and 20 street vendors). Ninety four percent of farmers produced banana in large scale and harvested them at mature green stage whereas, 49 percent of the farmers sold their fruits in local market. Traditional type of farming, deformed market structure, labor shortage, and influence of Indian banana, low price and high transportation cost were identified as major problems for commercial production and marketing. Seventy four percent of farmers grade their banana basically by size and color whereas, 28.50 percent used cushioning material during postharvest storage. Post-harvest losses of banana was observed in different stages of production like 9 percent loss in field during harvesting, 3 percent during packaging, 5 percent during processing and 1 percent during storage stage. In case of wholesalers, 2 percent loss was found during collection, 3 percent during transportation, 4 percent during supply to retailers. At retailers, 3 percent during collection, 2 percent during transportation, 2 percent during storage, 4 percent during retailing. At street vendors' level, 2 percent loss occurred during transportation and 5 percent loss during unsold stage. The overall losses of banana in marketing channel from field harvesting to street vendor were found 45 percent.

**Key words:** *banana, post-harvest losses, marketing channel, Chitwan, stages*

## **PRESENT STATUS AND PROBLEMS OF PERSIMMON (*DIOSPYROS KAKI*) PRODUCTION AT DAKSHINKALI MUNICIPALITY, KATHMANDU**

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A study on the present status and problems of persimmon (*Diospyros kaki*) production at Dakshinkali Municipality, Kathmandu was conducted using a semi-structured questionnaire. A total of 75 respondents were interviewed on 1<sup>st</sup> of the August to the last of the September of 2018. In the study area, most of the respondents adopted Japanese and local variety of persimmon. The objective of the study was to examine current status of persimmon production in the study area. Fifty eight percent of the respondents were male and 42% were female engaged in persimmon farming. The main problems were lack of irrigation, transportation and marketing of the produce at reasonable price. Main marketing centers were Pharping, Kirtipur, Kalimati and Balkhu of Kathmandu. The respondents had no exposure to any technical training on scientific cultivation practices. Training and support (governmental, organizational and institutional) should be provided to all the farmers involved in persimmon farming. They should be encouraged to cultivate improved variety along with the technical supports. The farmers should upgrade the knowledge and skill on persimmon cultivation, diseases and pest management and marketing. However, the productivity of persimmon was found to be good and income of farmers was increased compared to cereal crops.

**Key word:** *persimmon, marketing channel, diseases and pest management.*

## **STUDY ON VASE LIFE OF CUT ROSE FLOWER AND ITS POST HARVEST HANDLING TECHNIQUES ADOPTED IN KATHMANDU VALLEY**

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The present research on study on vase life of cut rose flowers and its post-harvest handling techniques adopted by growers and retailers in Kathmandu valley was carried out at laboratory of HICAST, Sanepa, Lalitpur, from 3<sup>rd</sup> July

to 17<sup>th</sup> July, 2018. A survey method was carried out for primary data and information collection for the study. All together 50 respondents were selected for survey. Among them, 8 growers, 4 respondents were wholesalers and 38 respondents were retailers. There were designed 5 treatments viz. T<sub>1</sub> (2.5% sucrose), T<sub>2</sub> (5% sucrose), T<sub>3</sub> (2.5% sucrose + 50ppm NaOCl), T<sub>4</sub> (250ppm citric acid) and T<sub>5</sub> (distilled water) control with 3 replications. The experiment was laid out in a complete randomized design. Among the different treatments, (T<sub>2</sub>) recorded highest water uptake (27.18g/cut flower) and the lowest in (T<sub>1</sub>) with water uptake 16.12g/cut flower. The highest fresh weight was recorded in T<sub>2</sub> (14.53g/f). The highest vase life was recorded in T<sub>2</sub> (10.08 days). The lowest pH value was observed in T<sub>1</sub> (3.6pH). In T<sub>1</sub> stem bending was seen in 7.26 days. The with 5% sucrose solution provided freshness to flower longer (8.78) days than other treatments. The study showed that 5% sucrose was found effective in terms of vase life, water uptake, freshness, stem bending, preventing from fungal infection and visual rating of flowers.

**Keywords:** *cut flower, vase life, sucrose, citric acid, sodium hypochlorite*

### **ROLE OF VEGETABLE FARMING IN INCOME GENERATION AND LIVELIHOOD IMPROVEMENT IN TANAHUN DISTRICT**

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The present study on role of vegetable farming in income generation and livelihood improvement in 2 municipalities (Vyas and Bhanu) and 1 rural municipality (Bandipur) of Tanahun district was carried out from June to September, 2018. All together 100 respondents were selected for primary data and information collection. Among them 35 respondents were from Vyas Municipality, 35 were from Bhanu Municipality and 30 were from Bandipur VDC. The main reason behind choosing these three areas was their high potentiality of commercial vegetable farming. The farmers of two different municipalities and one VDC engaged in vegetable farming were 53 percent male and 47 percent female respondents. Sixty two percent of the respondents were found to be literate and 38 percent of the respondents were illiterate. The age group between 35-45 years was found 54 percent in the study area. Thirty six percent of the respondents had total land holdings of 0.1 ha for vegetable farming. Most of the farmers (74%) had their own land for vegetable crops production while few had taken land in lease. Majority of the respondents (41%) had the annual income around NRs.1-2 lakhs. Majority of the respondents (43%) had double increment in the annual income after vegetable farming. They were able to increase their livelihood through the vegetable farming. Home manpower was 44.7 percent and outsider manpower was 55.3 percent. The lack of labor, quality seed and fertilizer at required time, disease and pest attack and the price fluctuation in the market were the major constraints in vegetable farming in Tanahun district.

**Keywords:** *vegetable farming, income generation, land holding, Tanahun district*

### **STUDY ON MARKETING STATUS OF VEGETABLE CROPS IN KATHMANDU DISTRICT**

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The present study was on marketing status of vegetable crops in Kathmandu district. It was undertaken in Kirtipur, Chandragiri and Tarkeshor municipalities during July to September, 2018. Although, 100 respondents were selected for study among them, 70 were producers, 15 wholesalers and 15 were retailers. In selected areas, different types of vegetables were found to be grown by farmers. Among them, 98 percent were growing tomato, 85 percent were growing cauliflower, 80 percent were growing cabbage and 60 percent were growing cucumber. Producers, wholesalers, retailers and middleman were the major actors involved in vegetable marketing. The 34.28 percent of respondents sell their product in Kalimati market, 20 percent to Balkhu market, 24.29 percent to local market, 11.43 percent to Balaju and 10 percent to others. The highest marketing margin was found in tomato and lowest in bitter

gourd that is NRs 35/kg and NRs. 15/kg respectively. During survey, it was found that about 52.72 percent of vegetables from different district were brought in Kalimati market and 44.64 percent were imported from India. There were five types of marketing channels existing in the study areas. However, producers to middlemen to retailers to consumers were identified as the most common channel for vegetable flowing across the study areas. About eighty six percent of the respondents were facing the problem of storage facility, 74.28 percent were facing the problem of packaging, 68.57 percent were facing the problem of inappropriate market price, 65.71 percent were dominated by middleman for price fixation, and 34.28 percent were facing the problem of high transportation cost.

***Key words: vegetable production, market, marketing channel, problems***

## **CURRENT STATUS ON POST-HARVEST PRACTICES OF APPLE IN JUMLA DISTRICT**

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A study on the current status on post-harvest practices adopted by apple farmers in Jumla district was carried out in from 28<sup>th</sup> July to 4<sup>th</sup> November 2018. Altogether 100 respondents were selected randomly for survey and pre-tested questionnaire were used to find out harvesting method, suitable packaging device and transportation method to improve shelf-life of fruits. The age group of respondents in between 45-55 was found to be maximum in apple production in the study area. Majority of the respondents had landholding less than 1 hectare for apple crops production. Most farmers had their own land for apple crops production while few had taken land in lease. Majority of apple growing farmers do not clean the apple after harvesting. The main reason behind it was the additional cost and the return of the cleaned apples and the unclean apple is same in local market and even outside the district. Farmers of Jumla have been grading their apple in several ways such as by color, size and shape. Due to high cost of cushion, 64 percent farmers preferred clothes as a cushion material so that they could use the same cloth again and again. The most commonly used storage system was an ordinary storage which was used by 92 percent of the farmers. Jute sacks, plastic crates, nylon fertilizer bag, cartoon were used to pack apples. The means of transportation used were backload of human beings in a bamboo basket and vehicles like tractors, jeep, and truck. Due to the insufficient knowledge of post-harvest handling and technology, there was a great loss of apple such as during harvesting 10 percent, transportation by 45 percent, in storage by 28 percent and in marketing by 17 percent.

***Keywords: apple, postharvest, self-life, packaging, Jumla***

## **STUDY ON THE CURRENT STATUS OF PROTECTED TOMATO CULTIVATION IN NARAYAN MUNICIPALITY, DAILEKH DISTRICT, NEPAL**

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Tomato is the third important vegetable crop after cauliflower and cabbage in terms of area and production in Nepal. The market demand of the tomato and area under cultivation is increasing day by day. A study on the current status of protected tomato cultivation in Narayan Municipality, Dailekh, Nepal was conducted from June 2018 to October 2018. This study was focused to assess the production and marketing of protected tomato in the mentioned location. Total of 60 respondents were randomly selected from different parts of the municipality and interviewed using pre-tested questionnaire. Tomato was found one of the most important high value incomes generating crops in the study area. Most of the farmers (50 %) were found to cultivate Srijana variety. Economic analysis showed that protected tomato cultivation was an economic enterprise. On an average the benefit cost ratio of protected tomato cultivation was found to be 3.65 and per unit investment return in protected tomato cultivation was 3.65. On an average the cost of tomato production was NRs. 34,691.8 per ropani. The average price of tomato at farm gate was found NRs. 27 per kg. The gross return from one kilogram tomato was obtained to be NRs. 20. Most of the tomatoes are sold in collection center. Along with managerial problems, lack of irrigation facility, disease, insect and pest affecting the crop were found to be major production problems and buyer's monopoly in price fixation, lack of price information

were major marketing problems in the study area. Therefore, for high economic returns and livelihood improvement of the farmers, the government and concerned agencies should have to play major role to overcome these problems.

**Keywords:** *tomato, protected cultivation, cost benefit ratio, economic analysis*

## **ROLE OF GINGER FARMING IN INCOME GENERATION AND LIVELIHOOD IMPROVEMENT OF RURAL FARMERS IN SURKHET DISTRICT**

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A study was carried out on the role of ginger farming in income generation and livelihood improvement of rural farmer in five different ginger producing areas, namely Awalching, Pamka, Garpan, Neta and Bheriganga Municipality of Surkhet district covering 100 households. In the study area, majority of the respondents (70%) depend on the agriculture for the income generation and livelihoods while remaining (30%) population was involved in other occupations. Majority of the farmers produced ginger seeds by themselves. Most of farmers (50%) in the study area were using local Bose variety; Nase (46%) and the rest (4%) used improved Kapurkot-1 variety. Farming was done under rained condition. Average annual income from local var. Bose per family was NRs. 590,500 per hectare. There were few incidences of rhizome rot and leaf spot diseases. Red ant and leaf roller attack in ginger plant was found occasionally in most of the surveyed area but the degree of crop damage was negligible. The major problems faced by ginger growers were lack of irrigation facility, poor transportation and road network in the study area and lower market price. There should be equal participation among ginger growers and government sector for development, production and extension of appropriate production as well as post-harvest technologies and infrastructure to produce transport and marketing facilities of ginger for good profit.

**Key words:** *ginger, income generation, livelihood system and food security.*

## **EFFECT OF DIFFERENT ORGANIC TREATMENTS ON SHELF LIFE AND QUALITY OF MANGO (MANGIFERA INDICA CV. MALDA)**

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A study about effect of different organic treatments on shelf life and quality of Malda mango (*Mangifera indica* cv. Malda) was conducted from 4<sup>th</sup> August to 16<sup>th</sup> August, 2018 at Horticulture Laboratory of Himalayan Collage of Science and Technology, Kathmandu. The aim of this study was to select suitable locally available plant extract to prolong the shelf life and quality of mango at mature stage. The experiment was conducted using five treatments arranged in completely randomized design (CRD), replicated at 4 times. Treatments were control (T1), Neem extract (T2), garlic extract (T3), Aloe vera extract (T4), and hot water (T5). Eight mangoes were taken in each treatment and stored under room condition (temperature 30±0.5 and humidity 75±1.5). During storage different qualitative and quantitative parameters (physiological loss in weight, color change, TSS, TA, TSS:TA ratio, pulp to peel ratio, pH, firmness and shelf life) were measured. The experiment showed better result in Aloe Vera extracts in parameters like color change, PLW (%), TA, TSS, TSS:TA ratio, pH and firmness i.e. 3.3 %, 17.93 %, 0.22 %, 17.23°Brix, 163.8, 5.43 and 0.375 lb respectively than other treatments. In case of shelf life Aloe Vera extract showed longest shelf life of 14.33 days followed by mango treated with hot water. Finally this study showed the better result in Aloe Vera extract in comparison to other treatments that had been selected.

**Key Words:** *Malda, mango, plant extract, shelf life, Aloe Vera*

## **POST HARVEST LOSSES OF POTATO ON DIFFERENT ACTIVITIES OF SUPPLY CHAIN AT KATHMANDU VALLEY**

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A survey research on postharvest losses of potato during supply chain at Rabiopi of Kavrepalanchowk district was conducted from 13<sup>th</sup> Aug to 1<sup>st</sup> September 2018. Kavrepalanchowk district was selected purposively and data was obtained from individual respondents with a pre-tested questionnaire, group discussion and key-informant survey. A total of 100 respondents were taken from 50 farmers, 25 suppliers and 25 retailers on the random basis and 3 focus discussions were done in each VDC. Demographic study showed that 61% of the respondents were male and 39% female. The average family size was 8 and majority of the age of respondent were above 40 (32%). In case of literacy 45% were illiterate, 28% primary, 19% secondary and 8% with university level education. Thirty seven percent of the respondents produced the potato in small scale whereas 16% respondent produced in large scale. In field during harvesting and grading there were 6% and 2% loss respectively. During packaging the loss of potato was negligible. At supplier level 4.75% and retailer level 5.25% post- harvest loss of potato was found to be present throughout the supply chain system. The overall losses of potato in supply chain system from field harvesting to retailing were 18%. The study of postharvest loss of potato showed insufficient knowledge to the producers level about the storage and random harvesting as well which leads to maximum loss of potato during supply chain. The producer plays important role in reducing the postharvest of potato during supply chain hence public awareness should be created through mass media about the proper harvesting and storing of potato at all level.

**Keywords:** *post-harvest, losses, potato, supply chain, Kathmandu*

#### **PRODUCTION AND MARKETING PRACTICES OF LEMON AND ITS ROLE IN INCOME GENERATION IN BUDHIGANGA RURAL MUNICIPALITY, MORANG DISTRICT, NEPAL**

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A study on production and marketing practices of lemon and its role in income generation in Budhiganga Rural Municipality, Morang was conducted from June to September 2018 by using a semi structured questionnaire. A total of 35 respondent farmers were purposively selected and interviewed in six wards within the Budhiganga Rural Municipality. The study showed that the involvement of male respondents was more in lemon farming than female. About 60% of the farmers were involved in lemon cultivation in the study area. Lemon fruit was important high value income generating crop in the study area. The most of the farmers at the study area were small and marginal farmers. The main problems of the study area were lack of irrigation, unmanaged marketing and lack of technical knowledge about lemon cultivation. Main marketing centers were Duhabi, Khanar, Itahari, Biratnagar and Birtamode. Major varieties of lemon cultivated in the study area were Local lime (40%), Eureka (35%) and Sunkagati (25%). Severe problems of leaf minor, stem borer and scale insects were observed. Although there were several production constraints most of the farmers were optimistic towards lemon farming. Analysis of benefit cost ratio showed that the lemon farming in the study area was highly profitable with an average benefit cost ratio of 3.64.

**Keywords:** *lemon, production, high value crop, marketing, Morang*

#### **DISTRICT STUDY ON FRUIT PRODUCTION AND ITS ROLE IN INCOME GENERATION AND LIVELIHOOD IMPROVEMENT IN MORANG**

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A study on fruit production and its role in income generation and livelihood improvement of farmers in the 2 municipalities (Dangihat and Jhorahat) and 2 rural municipalities (RM) (Gramthan RM and Rangeli RM) of Morang district was carried out. The study was conducted during 18th June to 25th September, 2018. A total of 100



respondents were selected for primary data and information collection applying simple random sampling technique. Among them 30 respondents were from Jhorahat municipality, 25 from Dangihat municipality, 20 from Rangeli RM and remaining 25 were from Gamthan RM. Both the gender was found to be involved in the fruit production in the study area. The primary information indicated that male (59%) respondents were higher as compared to females (41%). Most of the respondents (66%) were found to be literate while 34 percent were found illiterate. The age group of respondents in between 35-45 years was found to be maximum involved in the fruit production. Forty percents of the respondents had landholding in between 0.12-0.17 hectare for the fruit production. Most of the farmers had their own land while few had taken land on lease. Majority of the respondents (46%) had the annual income in between NRs. 2-5 lakhs while 51 percent of the respondents had doubled their income from their fruit production. They were found using their profit on their children's education, health and businesses. Similarly Biratnagar Bazar, Hathkhola Bazar and Haraicha Bazar were the major local markets for both wholesalers and retailers. Lack of fertilizer at required time, disease and pest attack and the price fluctuation in the market were the major constraints being faced by the farmers in the Morang district. To overcome these constraints different practical oriented trainings, modern tools and technologies loan and subsidies should be provided to the farmers.

**Keywords:** *fruit production, income generation, livelihood, Morang district*

### **STUDY ON ORGANIC FRUIT FARMING AND ITS ROLE OF INCOME GENERATION AND LIVELIHOOD IMPROVEMENT IN HIMA GAUPALIKA SINJA JUMLA**

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This study on organic fruit farming and its role of income generation and livelihood improvement of the farmers of Hima Gaupalika, Sinja, Jumla was carried out during October to December 2018. All together 81 respondents were selected for primary data and information collection. The primary information indicated that female (66%) respondents were higher as compared to male (34%) in selected area. Fifty five percent respondents were found to be illiterate, 20% were able to read and write, 15% respondents were with secondary level and 10% respondents were with primary level education. The age group of respondents between 30-40 years was dominating among the farmers who were mostly found to be participating in organic fruit farming system and using organic manures for plants nutrients. Fruit crop like organic apple was found to be widely cultivated in the study area because of its high market demand. The highest wholesale price in Jumla and Nepaljung was observed NRs. 60/ kg in October to November while the retail price in Nepaljung was NRs.115/kg. The average farm gate price of apple was too low, NRs. 26.93/kg as compared to wholesale, retail and consumers prices. The producers, traders, transporters, wholesalers and retailers were the main marketing actors of apple. Contractual system before and during production were observed in marketing. Price spread of Jumla apple was assessed with the different actors- contractors, traders, wholesalers, retailers and consumers. The annual income of the majority of the respondents (64%) was NRs. 40,000-60,000 and 36% of respondents had annual income NRs. 70,000-80,000. Higher percentage of farmers was found adopting organic farming but not able to improve their livelihood and income generation through the organic farming. The major constraints faced by farmers were lack of marketing and lack of knowledge about postharvest handling.

**Keywords:** *apple, organic farming, postharvest, livelihood, Jumla*

### **STUDY ON THE PRODUCTION AND PLANT PROTECTION MEASURES OF CUT FLOWER USED BY COMMERCIAL GROWERS IN KATHMANDU VALLEY**

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A study on the production, protection measures and constraints of cut flowers farming and business by commercial growers in Kathmandu valley was carried out. Altogether 86 respondents were selected for the study. The study was carried out during July to November 2018. A total of 9.5 hectares of land from three districts were used for cultivation of cut flowers by the growers. Sole cut – flower business was the main source of income of the

respondents in three districts. Similarly, respondent farmers with the landholding size in Kathmandu, Bhaktapur and Lalitpur ranging from more than 0.1 and less than 0.5 hectare were two in Kathmandu and for Bhaktapur and Lalitpur were one each respectively. The respondents' land area ranged from more than 0.25 to less than 1.25 hectare, for 3 respondents in Kathmandu and 5 in Bhaktapur. The grower having more than 1.25 to less than 2 hectare were 2 in Lalitpur whereas in Bhaktapur and Kathmandu growers there wasn't such large landholding. Overall, Bhaktapur was found to have highest land holding followed by Lalitpur and Kathmandu. All the growers were wholesalers themselves and major area for marketing was found to be in Tripureshwor, Kamaladi and in some temple areas of Kathmandu valley. Overall looking at the production at growers' level, rose was found to be produced at high number per year in Kathmandu and Lalitpur district. Insect pest and diseases were the main problems of loss at grower's level and post – harvest loss occurred more at wholesaler and retailer level. The highest losses occurred at retailer's level. The main reason behind this may be due to the longer storage period at retailer's level as compared to growers and wholesaler level.

**Keywords:** *cut flower, rose farming, cultivation, constraints, Kathmandu*

### **STUDY ON VASE LIFE OF GERBERA FLOWER AND ITS POST-HARVEST HANDLING TECHNIQUES ADOPTED IN KATHMANDU VALLEY**

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The present study on vase life of gerbera flower and its post-harvest handling techniques adopted in Kathmandu valley was conducted during the month of July 2018. Both laboratory and field survey were carried out. Laboratory work was conducted at HICAST laboratory and the field survey was carried out in Kathmandu valley. There were designed 5 treatments viz. T<sub>1</sub> (2.5% sucrose), T<sub>2</sub> (5% sucrose), T<sub>3</sub> (2.5% sucrose + 50ppm NaOCl), T<sub>4</sub> (250ppm citric acid) and T<sub>5</sub> (distilled water) as control with 3 replications. The experiment was laid out in a complete randomized design. But in case of field survey, altogether 50 respondents (15 growers, 3 wholesalers and 32 retailers) were selected. Among the different treatments, highest water uptake (25.8g/cut flower), highest fresh weight (21.33g/f) and highest vase life (14.40 days) were recorded in T<sub>4</sub>. The lowest pH value was observed in T<sub>1</sub> (3.2). In T<sub>5</sub>, stem bending was seen in 9.47 days. The T<sub>4</sub>, 250 ppm citric acid solution, showed late fungal infection (11.84 days). The study showed that 250 ppm of citric acid was found effective in terms of vase life, water uptake, stem bending, fungal infection and visual rating of flowers. Besides the study, fluctuation of temperature and relative humidity may have affected vase life of gerbera cut flower. In the field survey, only one wholesaler and one retailer were found who used preservatives as a holding solution for flowers and rest of all the respondents used water. None of the respondents used refrigerated vehicles for transportation whereas only few had refrigerator to store flowers.

**Keywords:** *vase life, sucrose, citric acid, sodium hypochlorite, post-harvest*

### **ASSESSING THE DAMAGE OF TUTA ABSOLUTA ON TOMATO CULTIVARS UNDER POLY HOUSE AND OPEN FIELD CULTIVATION IN KATHMANDU LALITPUR AND KAVREPALANCHOWK DISTRICT**

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An assessment on the damage of *Tuta absoluta* on tomato cultivars under polyhouse condition was conducted in Kathmandu, Lalitpur and Kavrepalanchowk districts of Nepal during July 2018 to November 2018. All together 100 households were selected for primary data and information collection and research tools like questionnaire, focus group discussion, direct observation and the review of literature were used for the study. The majority of respondents (84%) cultivated tomato under tunnel and only 16 percent respondent's cultivated tomato in open field. The majority of respondents were growing Srijana and Samjhana varieties. Among various pests seen in the field, *T.*

*abosoluta* was the most devastating insect pest with 100% occurrence as the pest problem. The majority of respondents (49%) used synthetic chemicals as pesticides. IPM was followed by 18% while the use of both IPM and synthetic chemical was applied by 30 % of them. Three percent of farmers responded that they don't use any method. The incidence of *T. absoluta* was higher in Srijana variety (74%) still farmers were found preferring Srijana variety. According to the study, in Kathmandu district, 0-20 % foliage destruction was found while in Lalitpur and Kavrepalanchowk it was observed higher (21-40%). In decision making, majority of respondents had mutual decision making for tomato production, household expenditure, purchase inputs and loan. As for food security it was found that in average only 9% could sustain the food security throughout the year by tomato farming. Most of them (47%) could earn enough food for about 3 months by tomato farming.

**Keywords:** *Tuta absoluta, IPM, cultivars, foliage, field, polyhouse*

## **STUDY ON THE POST HARVEST LOSSES OF MANGO DURING THE MARKETING CHANNEL IN CHITWAN DISTRICT**

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A study was conducted on the post-harvest losses of mango during the marketing channel in Chitwan district. A hundred respondents were selected for primary data and information collection (40 farmers, 20 suppliers, 25 retailers and 15 vendors). Among the respondents, 35 percent were females and 65 percent were males. In case of literacy rate 37.5 percent were primary level, 15 percent illiterate, 27.5 percent secondary level and 20 percent high school in survey area. Ninety four percent respondents were producing the mango in small scale whereas only 2 percent respondents were producing the mango in large scale. Although overall losses of mango in marketing channel from field harvesting to vender was found to be 43%. At farmer's level, 6 percent losses were reported during harvesting, 5 percent losses were reported during packaging, 5 percent losses were reported during processing, 1 percent loss was reported during storage. At wholesalers, 3 percent losses were reported during collection, 4 percent losses were reported during transporting, and 3 percent losses were reported during supply to retailers. At retailers, 3 percent losses were reported during collection, 1.74 percent losses were during transportation, 2 percent losses were reported during storage, 4 percent losses were reported during retailing. At vendors, 1 percent losses were reported during transportation, and 4 percent losses were reported during unsold product.

**Keywords:** *post-harvest, losses, mango, marketing, channel*

## **STUDY ON THE POST HARVEST LOSSES OF LITCHI (*LITCHI CHINENSIS*) DURING THE MARKETING CHANNEL IN BHARATPUR, CHITWAN**

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A study on post-harvest losses of litchi during the marketing channel in Bharatpur, Chitwan district was conducted to assess postharvest losses of litchi fruit during the marketing channel. Altogether 75 respondents were selected for primary data and information collection (25 farmers, 15 wholesalers, 20 retailers and 15 vendors). Among the total respondents, 35 percent were females and 65 percent were males. In case of literacy rate, 36 percent were at primary level, 32 percent were illiterate and 32 percent were at secondary level of education. About 17 percent respondents produced the litchi at small scale (1-5 ha), 28 percent respondents produced the litchi at moderate scale (5-8 ha) whereas 55 percent respondents produced the litchi at large scale (above 10 ha). At farmer's levels, the total postharvest loss was 12.14 percent which included losses during harvesting (5.8 percent), packaging (3.2 percent), processing (1.04 percent) and storage (2.1 percent). At retailer's levels, the total loss was 11.3 percent which included losses during collection (3.2 percent), transportation (3 percent), storage (2 percent) and retailing (3.1 percent). At wholesaler's levels, the total loss was 9.2 percent which included losses during collection (2.1 percent), transportation (4.2 percent) and supplying (2.9 percent). At vendor's levels, the total loss was 5.2 percent which included losses during transportation (1.1 percent) and unsold produce (4.1 percent). The overall loss of the litchi in the marketing channel from farmer's level to vendor's level was around 37.8 percent.

**Keywords:** *post-harvest, losses, litchi, Chitwan, marketing*

### **STUDY ON THE POST HARVEST LOSSES OF VEGETABLE IN DIFFERENT STEP OF MARKET SUPPLY IN KATHMANDU VALLEY**

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A study was conducted to understand the post harvest losses of vegetable crops in different steps of market chain in Kathmandu valley. Altogether 100 respondents were selected (50 farmers, 25 suppliers and 25 retailers) for primary data and information collection). The objective of the present study was to examine the post harvest losses of vegetable in Kathmandu valley during the market chain system. Among the respondents 64% farmers, 60% wholesalers were male and 44% were female. In case of literacy rate among farmers, 20 % were primary level, 32 % secondary, 32 % intermediate and 10 % university level education while rest 16 % were illiterate. Among suppliers 16 % primary, 36 % secondary, 32 % intermediate and 20 % were with university level education. The literacy rate among retailers was found with 28 % primary, 32 % secondary, 24 % intermediate and 8 % with university level education in the survey area. Fifty eight percent of the respondents were producing the vegetable in small scale, 24% were moderate whereas 18% respondents were producing the vegetable in large scale. The post harvest losses in field during harvesting was 5% while during packaging was 6%. At suppliers level the post harvest losses were 1% during collection, 3% during supply to retailers and 3% during post supply. At retailers, the post harvest losses during collection was 3%, during transportation 2%, during storage 1%, during retailing post harvest losses of vegetable was 4%. The overall losses of vegetables in supply chain from field harvesting to retailing were found to be 28 percent.

**Keywords:** *post harvest, losses, vegetable crops, market chain, Kathmandu*

### **BITTER GOURD (*MOMORDICA CHARANTIA*) PRODUCTION AND MARKETING PRACTICES IN KATHMANDU VALLEY, NEPAL**

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A study on production and marketing practices of bitter gourd (*Momordica charantia*) in Kathmandu Valley was conducted during September to November 2018 using a semi-structured questionnaire. A total of 60 respondent farmers were purposively selected and interviewed. Bitter gourd was one of the important high value income generating crops in the study area. In the study area, 83.34% of the farmers cultivated Haryo Karela variety of bitter gourd. Majority of the producer farmers (80-90%) sold their produce at nearby local markets. The main problems of the study area were lack of irrigation and marketing of the produce at reasonable price. Eighty five percent of the respondent farmers were involved in the bitter gourd farming in very small land area so it was hard to find commercial farming during survey period. Severe problems of red pumpkin beetle and fruit fly were seen. Disease like powdery mildew and downy mildew were also observed. The respondents were found deficient in the skill of cultivation and the knowledge's about correct dose, frequency and time of pesticides application. Seventy percent of the farmers had training where 30% of them hadn't taken training. The average benefit cost ratio of the bitter gourd farming in the study area was 1.53.

**Keywords:** *bitter gourd, high value crop, production, marketing practices, B:C ratio*

### **AN ASSESSMENT OF POSTHARVEST LOSS OF TOMATO (*LYCOPERSICON ESCULANTUM*) IN DIFFERENT SUPPLY CHAIN IN KATHMANDU**

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A study to assess the post harvest loss of tomato (*Lycopersicon esculentum*) in different supply chains and actors involved in Kirtipur, Tokha, Chandragiri municipalities of Kathmandu district was conducted from August to November 2018 and seventy five percent respondents were selected for primary data and information collection (30 farmers, 30 wholesalers and 15 retailers). Among the respondents more male farmers were seen involved in tomato farming. Among them 53.33% farmers, 60% wholesalers and 60% retailers were male population. In case of literacy rate for farmers, 20% were with primary level, 40% secondary, 16.66% intermediate, 10% university and 13.33% illiterate. For suppliers, 26.66% primary, 33.33% secondary, 20% intermediate and 20% university level and for retailers, 40% primary, 33.33% secondary, 20% intermediate and 6.66% university level in the survey area. About 43% respondents produced tomato in small scale, 30% in moderate scale, 16.66% in large scale whereas, and 10% in the larger scale. At farmers level the post harvest losses were 5% and 4% during harvesting and packaging respectively in the field. At wholesaler's level, the postharvest losses were 1% and 3% during collection and transportation respectively. Similarly at retailer's level, the post harvest losses were 3%, 2%, 1% and 4% during collection, transportation, storage and retailing respectively. The total postharvest losses of tomatoes in supply chain from field harvesting to retailing were found to be 23% in Kathmandu district. Different actors involved in supply chain in Kathmandu were producers, middleman, commission agent, wholesalers, retailers and consumers. The farmers, wholesalers and retailers were seen adopting the improved post harvest for continuation to greater extent however efforts are needed for further reduction of post harvest loss in tomato through the proper awareness creation in every level of value chain actors and intervention for improved post harvest practices.

**Keywords:** *assessment, Kathmandu, supply chain, Tomato, loss*

#### **PRODUCTION AND MARKETING PRACTICES OF RAINY SEASON POTATO IN DUPCHESWOR RURAL MUNICIPALITY OF NUWAKOT DISTRICT**

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A study on production and marketing practices of rainy season potato in Dupcheswor Rural Municipality of Nuwakot District was conducted from June to September, 2018 to identify major problems of the farmers in the study area. Altogether 60 households were randomly selected as respondents. Almost 75% percent of the respondent farmers used improved varieties like Cardinal, Kurfi Jyoti, MS 42, Janak Dev and Dejire whereas 25% used local varieties such as Rato Gulab and Seto Gulab. The respondents were found lacking in technical knowledge for rainy season potato cultivation and knowledge about correct dose, frequency and time of pesticides application. The farmers were attracted towards rainy season potato farming because of high income, climatic suitability and availability of supports from NGO's and INGO's. The results showed that the average yield of rainy season potato was 501.55 kg per ropani; average price was NRs. 52.75 per kg, average cost of production was NRs. 11113.33 per ropani, average net profit was NRs. 14891.5 per ropani and average benefit cost ratio was 2.38. The major problems faced by the potato farmers were incidence of pests and diseases, irrigation and rotting of potato during storage.

**Keywords:** *production, practices, problems, marketing, benefit - cost ratio*

#### **PRODUCTION PRACTICES OF OKRA AND ITS MAJOR PROBLEMS IN BHAKTAPUR DISTRICT**

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The main objective of this study was to assess the production practices of okra in Bhaktapur district, discover the major problems that had been causing a barrier in commercialization of this crop and come up with possible suggestions for its commercialization in this area. The survey was conducted during July to August 2018. Sixty

random samples were collected from three municipalities. A semi structured questionnaire was prepared and each respondent were interviewed in order to collect primary information. The study revealed that 66.67 percent of the respondent's populations were males. Eighty percent of the populations were outside of the Bhaktapur district. Maximum number of farmers belonged to the age group of 21-40. Eighty five percent of the population was found to be literate. Out of total population 58 percent chose this enterprise because it was easy to cultivate. It was found that 83.33 percent of the populations were dependent on agro-vet vendors for the seed. Seventy percent respondents were using Nepali local variety. Rain water was the major source of irrigation for half (50 percent) of the population. June to July was the main sowing season for okra production in this area. Manual weeding was carried out for 1-2 times by all the respondents. About 90 percent were found to be using chemical method for controlling insects and diseases. The major problem hindering the commercial production of okra was found out to be market. Lack of farmers' knowledge on the knowledge of its cultivation was observed. The maturity indices of okra were found to be change in size and color (from dark green to light green) and harvesting was done in the morning hour by 60 percent of the respondents.

**Key words:** *socio economic profile, maturing time of sowing, harvesting, problems*

### **STUDY ON THE VASE LIFE OF GLADIOLUS AND THE MAJOR POST-HARVEST LOSSES IN GLADIOLUS IN KATHMANDU VALLEY**

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The present investigation was on the vase life and the major post-harvest losses in gladiolus in Kathmandu valley. The experimental flowers were taken from "United flora pvt. Ltd". Teku, Kathmandu and the vase life experiment was done from 3<sup>rd</sup> July to 19<sup>th</sup> July 2018 at the laboratory of HICAST, Kathmandu. The experimental flowers were subjected to 5 treatments, T1 (2.5% Sucrose), T2: (5% sucrose), T3: (2.5% Sucrose+50ppm sodium hypochlorite), T4: (250ppm citric acid) and T5 (Distill water) as control. Five parameters were taken: i) weight of flowers, ii) total water uptake by flowers, iii) Fungal infection, iii) Freshness of flower iv) vase life percentage of open floret, v) number of opened top floret and days taken to open it were recorded during experimental period. The experiment was laid out in a completely randomized design (CRD) with three replications. The experimental room was having 30±2 degree Centigrade temperature and humidity of 59.8%. The longest vase life (10.87 days) was observed in 2.5% sucrose, whereas the shortest vase life was observed in distilled water (7.75 days). The survey on post-harvest losses was carried out in Bhaktapur, Kathmandu and Lalitpur during June to August, 2018. Thirty respondents were selected for survey, of which 8 were growers, 3 were wholesalers and 19 were retailers. Out of 30 respondents, 21 (70%) were male and the highest percentage of male was found in Kathmandu (73.69%) followed by Bhaktapur (66.66%) and Lalitpur (30 %). The highest loss occurred during handling at grower's level whereas higher loss occurred during the storage in wholesaler's level as well as in retailer's level. The losses occurred is the highest at retailer's level in comparison to growers and wholesalers level. The main reason behind this may be due to the longer storage period at retailer's level as compared to growers and wholesaler's level.

**Key words:** *gladiolus, vase life, post-harvest losses, cultivars, storage*

### **A STUDY ON POSTHARVEST HANDLING OF TOMATO (*LYCOPERSICON ESCULENTUM*) IN CHANGUNARAYAN MUNICIPALITY OF BHAKTAPUR DISTRICT**

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This study was conducted in Changunarayan municipality of Bhaktapur District, Nepal to know about the post harvest handling of tomato (*Lycopersicon esculentum*). The site survey was conducted during July to August 2018 employing household survey and focus-group discussions. For household survey, 60 households were purposively selected by using simple random sampling technique. The study revealed that 80 percent of the farmers were male,

maximum farmers belonged to age group of 21 to 40 years and 70 percent of farmers were found to be literate. The main occupation of the respondents was agriculture (78.33 %); few respondents had small business and young generation was found to be go abroad or major cities for employment. Out of total respondents, 16.67 percent had taken general training on agriculture. Respondents (13.33 %) harvest tomato at pink stage, 18.34 % at breaker + pink stage and 68.33 % at ripe stage. Out of total respondents only 48.19 % used clean water for cleaning tomato while 78.33% did nothing. All the respondents simply separated the damaged and rotten pieces of tomato but did not apply any grading technique. Ninety three percent of respondents used plastic crates for packaging materials. A few number (6.67 %) of respondents used bamboo basket (Doko) for packaging. The total loss of tomato during post harvest handling was found to be 7 percent. Poor knowledge on postharvest technology and storage was found to be a major problem. Although there are many challenges, farmers were satisfied with tomato cultivation as it contributed significantly to raise their living standards.

***Key words: tomato, post harvest handling, post harvest losses, post harvest technology, cultivation***

# SOIL SCIENCE



## **SOIL FERTILITY EVALUATION OF TRIYUGA WATERSHED UNDER CHURE RANGE, UDAYAPUR DISTRICT**

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A study on “Soil Fertility Evaluation of Triyuga Watershed under Chure Range Udayapur District” was carried out to know the soil fertility status throughout the study area of watershed along with varying land types within the area i.e. forest land, upland and lowland. All together 45 soil samples were collected, 15 soil samples from each land type and 30 households. Similarly, other information was also taken for the study. The three land types were considered as treatments i.e. T1 (Forest land), T2 (Upland) and T3 (lowland). According to the respondents, soil erosion was medium to high in the Chure region and forest fire was also seen high during March-April which showed its effect in soil nutrients variation. The high movement of people over the fragile land seems to show trampling effect resulting in more erosion. Soil pH was found to be low in T1 (6.5). It may be due to litters accommodation and rapid surface run off which varied significantly ( $P < 0.05$ ). Soil organic matter (SOM) content was low throughout the study area of watershed with grand mean 2.08% but slightly higher in T3. Same case was found in total nitrogen content. The variation was found to be low to medium with grand mean 0.08%. Phosphorus varied significantly at T1 ( $P < 0.05$ ) with low available phosphorous level and comparatively higher in T2. The potassium was found higher in T3 with significant difference ( $P < 0.05$ ). The texture of the overall watershed was found sandy loam. Sand percentage was high in majority of the soil samples. Upland (T3) had higher 73.4% sand with significant difference to others ( $P < 0.05$ ). Silt and clay didn't show significant difference over the land types. The overall nutrient content of watershed was found to have low N and OM content. The majority soil samples were indicated to have low nutrients content. Thus, immediate soil conservation technologies adoption is necessary. Generally, forest and upland sector needs soil conservation action. Simultaneously, soil conservation practices and crop land management can solve the issues of soil and nutrients losses from the Triyuga watershed.

***Key words: nutrient evaluation, watershed, land types, erosion, forest fire, trampling effect, leaching***

## **COMPARATIVE STUDY OF SOIL NUTRIENTS STATUS UNDER BRICK PROCESSING AND AGRICULTURAL LAND OF BHAKTAPUR DISTRICT**

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This study was conducted to investigate the effect of brick industries on agricultural productive land in ten different brick factories of Bhaktapur district starting from 11<sup>th</sup> August till December 2018. The purpose of the study was to know the amount of nutrients dumped by brick factories and nutrient stored in the bricks. Four treatments from ten different kilns were selected i.e. raw brick, furnished brick, soil within the premises of industry and soil from nearby agricultural lands. Soil Samples were collected and analyzed for their total nitrogen, available phosphorus, available potassium, pH and organic matter content following standard procedure. The data were subjected to statistical analysis using GenStat software. The result showed that there is significant decrease in nitrogen, phosphorus, potassium and organic matter content of the soil from agricultural land to excavated land and from raw brick to burnt brick. Highest amount of nutrients and OM content was found on agricultural land whereas, lowest was present in burnt bricks. For pH, soil from agricultural land was found to be more acidic ( $< 5$  pH unit) in comparison to excavated land. Similarly, slight decrease in pH was noticed after burning the brick. It was found that about 44.89% of nitrogen is stocked in furnace brick while 83.125% of nitrogen is lost from excavated land to furnace brick. Similarly, 52.80 % and 67.85% of phosphorus and potassium is stocked in furnace brick with the loss of 69.13% and 81.66% of them respectively from excavated land to burnt brick whereas, 46.60% of organic matter is dumped in brick with loss of 59.70% from excavated land.

***Key words: brick kilns, agricultural land, excavated land, raw brick, burnt brick, soil chemical properties.***

## **EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON WHEAT AND SOIL CHEMICAL PROPERTIES UNDER HIGH HILL CONDITION**

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The present study was conducted in wheat-common bean cropping system to evaluate the influence of different nutrient fertilizers on different plant parameters of wheat and soil properties in Vijayanagar, Jumla during the period of 18th, Mangsir, 2074. The experiment was laid out in Randomized Complete Block Design (RCBD) with seven treatments and three replications. The designed treatment combination was i.e. Control (T 1), RDF (80:40:40 kg ha<sup>-1</sup>) (T 2), Full Organic fertilizer 10t FYMha<sup>-1</sup> (T 3), 50% RDF + 50% FYM (T 4), 50% Inorganic fertilizer (40:20:20 N: P 2 O 5: K 2 O kg ha<sup>-1</sup>) (T 5), 50% Organic fertilizer (5t FYM ha<sup>-1</sup>) (T 6), and RDF+6t FYM (T 7). Result showed that there were no significant changes in soil chemical properties due to the different nutrient treatments. Days of maturity (p value < 0.03) and Spike/m<sup>2</sup> (p value < 0.02) were significantly different among the treatments. However the application of RDF (80:40:40 N: P 2 O 5: K 2 O kg ha<sup>-1</sup>) in recorded soil showed the highest yield followed by the application of 50% RDF. Similarly in case of soil properties T 6 had the highest nitrogen content (0.07%), T 7 had highest organic matter content (5.78%), T 3, T 4 and T 6 had highest available potassium content (493 kg ha<sup>-1</sup>), T 1 and T 2 had a highest available phosphorus content (82 kg ha<sup>-1</sup>). From the results, a sustainable option from soil productivity perspective was application of RDF+ 6t farm yard manure.

**Key Words:** soil fertility, plant parameters, soil properties, fertilizers, wheat, high-hill

#### **EFFECT OF JHOLMAL-1 APPLICATION ON BENEFICIAL SOIL MICROBIAL POPULATION IN KAVREPALANCHOK DISTRICT OF NEPAL**

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The study was conducted to investigate the effect of Jholmal-1 application on beneficial soil microbial population in Kavre district. The research was conducted in Kalcchhibesi village for 3 months, starting from 1st August. Soil chemical properties and population of four beneficial microbes viz. Trichoderma, Rhizobium, Azotobacter and Phosphorous Solubilizing Bacteria (PSB) were investigated under Jholmal-1 treatment. The experiment was conducted in the area where different types of Jholmal including Jholmal-1 have been used since 2015. Two plots and two test crop viz. Bittergourd and Cowpea were taken and the effect of Jholmal-1 was compared with control plot in different time interval of crops i.e. before sowing, at fruiting and after harvest. Three replications of rhizospheric soil of different crops at different time interval were collected. Results showed that maximum Azotobacter (172.1 X 10<sup>7</sup> CFUg<sup>-1</sup>), Rhizobium (1087.8 X 10<sup>7</sup> CFUg<sup>-1</sup>), PSB (71.6 X 10<sup>7</sup> CFUg<sup>-1</sup>) and Trichoderma (308.4 X 10<sup>7</sup> CFUg<sup>-1</sup>) population were observed in Jholmal-1 applied plots compared to control plots. Significant variation was found in Nitrogen, Phosphorous and Potassium content, whereas non-significant variation was seen in pH and Water holding capacity (WHC) in different crops at different time interval with the application of Jholmal-1. The soil organic carbon was higher (0.2) in Jholmal-1 used plot than control plot. Maximum N content was noticed after harvest (0.29% in Cowpea and 0.33% in Bittergourd) and 75.25 kg/ha of Phosphorous in Cowpea and 224.32 kg/ha of Potassium in Bittergourd under Jholmal-1 used plot. The study concluded that 300ml of Jholmal-1 application showed a high growth rate in beneficial soil microbes, organic matter content and nutrient availability in the soil.

**Key Words:** jholmal-1, microbial dynamics, nitrogen, phosphorus, organic carbon, pH

#### **EFFECT OF DIFFERENT COMBINATIONS OF FERTILIZER AND MANURE ON BARLEY PRODUCTION AND SOIL PROPERTIES UNDER HIGH HILL CONDITION**

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A field experiment was conducted on “Effect of different sources of nutrient on Barley production and soil properties under high hill condition” at Bijaynagar, Jumla. The experiment was laid on the field with RCBD design with 7 treatments and 3 replications. The barley of Chauhi variety was used. The treatments employed viz. control (T1), Recommended dose 45:30:20 N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O kg/ha (T2), Full organic manure 6 ton FYM per ha (T3), ½ organic and ½ inorganic fertilizer (T4), Only ½ organic manure (T5), Only ½ recommended dose of fertilizer (T6) and Recommended dose + Full organic manure (T7). R software was used for the statistical calculations. The soil samples were collected from all the 21 plots and analyzed for pH, OM%, total nitrogen%, available phosphorus kg per ha and available Potash kg per ha. The plant parameters Days to heading, days to maturity, plant height, spike length, spike length per meter square, 1000 grain weight, Grain per spike, grain yield per plot, total grain yield and moisture % were observed. Obtained results indicated that there was no significant effect on the soil parameters and plant parameters due to the application of different sources of nutrient on Barley of variety Chauhi. The positive response was found in treatment with full dose of FYM.

**Key words:** *Barley, high hills, nutrients, soil properties, plant parameters*

### **SOIL FERTILITY ASSESSMENT UNDER VEGETABLE BASED CROPPING SYSTEMS IN BHARATPUR METROPOLITAN CITY, CHITWAN DISTRICT**

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This study was conducted on “Soil Fertility Assessment under Vegetable Based Cropping Systems in Bharatpur Metropolitan city, Chitwan District” to evaluate soil fertility status under different vegetable growing area in Bharatpur metropolitan city, Chitwan district, at ward number 4, 6, 21, 5, 15 and 3 respectively. Questionnaire survey was scheduled from 30 vegetable growing farmer households of selected wards. Simultaneously 30 soil samples were collected from respective farmer’s field at 0-15 cm depth. Laboratory analysis for the determination of soil parameters like pH, OM, N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O was done by adopting the standard method in the Soil Management Directorate Department of Agriculture, Hariharbhawan, and Lalitpur. The soil test shows that mean soil pH of ward number 4 was nearly neutral (6.8), very low in total nitrogen (0.049%), medium in available potassium (216 kg ha<sup>-1</sup>), low in available phosphorus (24.47 kg ha<sup>-1</sup>) and low in organic matter (1.85%). The mean soil pH of ward number 6 was nearly neutral (6.74), low in total nitrogen (0.09%), low in available potassium (100.8 kg ha<sup>-1</sup>), medium in available phosphorus (39.02 kg ha<sup>-1</sup>) and low in organic matter (1.01%). The mean soil pH of ward number 21 was slightly acidic (6.16), low in total nitrogen (0.06%), medium in available potassium (110.4 kg ha<sup>-1</sup>), high in available phosphorus (59.63 kg ha<sup>-1</sup>) and very low in organic matter (0.831%). The mean soil pH of ward number 5 was nearly neutral (6.56), medium in total nitrogen (0.12%), medium in available potassium (182.4 kg ha<sup>-1</sup>), high in available phosphorus (60.82 kg ha<sup>-1</sup>) and low in organic matter (1.77%). The mean soil pH of ward number 15 was nearly neutral (6.68), very low in total nitrogen (0.045%), medium in available potassium (120 kg ha<sup>-1</sup>), low in available phosphorus (55.97 kg ha<sup>-1</sup>) and low in organic matter (1.47%). The mean soil pH of ward number 3 was nearly neutral (6.98), low in total nitrogen (0.059%), medium in available potassium (254.4 kg ha<sup>-1</sup>), high in available phosphorus (57.71 kg ha<sup>-1</sup>) and low in organic matter (1.47%). Major of the farmers confirmed that the fertility status of the study area was not satisfactory due to the imbalanced use of chemical fertilizers, not following cropping pattern i.e. mono-cropping and use of fewer amounts of organic fertilizers. Therefore, it is recommended to apply OM, and balanced fertilizers through different sources for improving soil fertility within the vegetable farming lands.

**Key words:** *organic matter, balance fertilizers, soil nutrient status, vegetable growing area*

### **EFFECT OF INTEGRATED PLANT NUTRIENT MANAGEMENT ON SOIL FERTILITY STATUS, GROWTH AND YIELD OF SOYBEAN (var. *Sathiya*), KATHMANDU**

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Soybean is a leguminous crop occupying the third place among legumes in Nepal. It is a rich and inexpensive source of dietary protein and nutrients like fiber, vitamins, and minerals. Despite its nutritive value, the production of soybean in Nepal has not been commercialized. Lack of effective nutrient source for crop production is one of the major factors behind its low production. The study was carried out at Dakshin Dhoka inside Kathmandu valley in 2018 to evaluate the response of integrated plant nutrient management practice on soil fertility status, growth and yield of Soybean. The five treatments (T<sub>1</sub>: 100% N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O, T<sub>2</sub>: 75% N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O + 25% organic manure, T<sub>3</sub>: 50% N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O + 50% organic manure, T<sub>4</sub>: 25% N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O + 75% organic manure, and T<sub>5</sub> the control plot without any fertilizers) were replicated four times each. The IPNM showed better results over all the parameters as compared to the control plot and that with only the inorganic source. T<sub>3</sub> showed best performance on plant and soil parameters like number of branches, biological yield, straw yield, economic yield, total soil nitrogen content, and available potassium. Likewise, T<sub>2</sub> performed the best on parameters such as 100 seed weight, number of seeds/pod, available phosphorus, organic matter percentage in soil while the plant canopy was found to be increasing at highest rate under T<sub>4</sub>. The effect of IPNM was however, insignificant in all the parameters except for no. of pods/plant. Meanwhile, plant height was obtained tallest under T<sub>1</sub>.

**Keywords:** *soybean, IPNM, plant growth parameters, yield parameters, soil properties*

## **STUDY ON RESTORATION OF SOIL DEGRADED DUE TO BRICK INDUSTRY AT BHAKTAPUR**

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A lab study was conducted at HICAST soil lab, Sanepa, Lalitpur to analyze the possibility of degraded land restoration by the use of organic manure (OM) in the soil collected from Chhaling and Changu rural municipality of Bhaktapur District. Descriptive study was done prior for the different soil sample collected from three land types i.e. brick kiln premises, excavated land and agricultural land. Further lab study was carried out by adding 2% and 4% OM by weight on 100g of each soil samples, replicating each for three. The samples were incubated for 45 days and soil chemical properties; N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, pH and soil organic matter were analyzed. It was revealed that with the application of 4% OM by weight in all soil samples collected, there was increase in chemical parameters analyzed, followed by 2% OM by weight. The total soil nitrogen content and soil organic matter content was found significant (P<0.05) with different treatment of OM. Significant change was seen in the phosphorus content in the soil from brick kiln premises with the application of 4% OM. Slight increase was seen in the potassium content with the application of different treatments in the soils. With the application of 2% and 4% OM, pH was found to be increased significantly in the soil from brick kiln premises. Thus from this study, it is revealed that the use of 4% OM by weight might be optimal to restore the land degraded by the brick kilns and excavation.

**Keywords:** *restoration, organic manure, agricultural land, excavated land, brick kiln premises*

## **LEVEL OF NITROGEN REQUIREMENT FOR TAICHUNG RICE VARIETY (*ORYZA SATIVA*) AT CHAALING CONDITION, BHAKTAPUR**

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A study was conducted to study the best level of nitrogen requirement of Taichung variety of paddy at Chaaling, Bhaktapur from 16<sup>th</sup> May, 2018 to 27<sup>th</sup> October, 2018. This study consisted of eight levels of nitrogen viz: T1=Control(0:0:0 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O), T2=90:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, T3=95:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, T4=100:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, T5=105:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, T6=110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, T7=115:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, and T8=120:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O in randomized block design (RCBD) replicated three times. The study revealed that grain yield (6.44t/ha) and straw yield (24.83t/ha) was observed significantly (p<0.05) highest with application of 100:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O and 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O respectively. Similarly, paddy height (134.2cm) and tiller per plant (117/m<sup>2</sup>) were significantly (p<0.05) highest with 115:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O and 120:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Panicle length and thousand grain weight was

found insignificantly ( $p>0.05$ ) highest with 100:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Two treatments were found equally promising from the study i.e. T4=100:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O and T6=110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Grain yield of 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O was at par with 100:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Straw yield is highest with T6=110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Good response of plant height (134cm), tiller (98/m<sup>2</sup>), panicle length (24.57cm) and TGW (19.71g) was also achievable with 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Also, soil analysis after harvest of rice indicates highest total soil nitrogen (0.17%) with 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O followed by 120:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O (0.13%). Similarly, soil available phosphorus (30.37kg/ha) and available potassium (128kg/ha) was also found high with 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O. Thus, this study reveals that 110:40:30 kg/ha N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O might be better.

**Keywords:** *Chaaling, dose, level, grain yield, nitrogen, N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, straw yield, Taichung*

### **COMPARATIVE STUDY ON SOIL FERTILITY STATUS OF SWEET ORANGE ORCHARDS IN SINDHULI DISTRICT (GOLANJOR RURAL MUNICIPALITY)**

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The thesis entitled “Comparative study on soil fertility status of sweet orange orchards in Sindhuli district (Golanjor Rural Municipality)” was carried out from June 28, 2018 to September 25, 2018 to find out the soil fertility status of sweet orange orchards in Sindhuli district. The soil samples were taken from the 10 wards of Golanjor Rural Municipality: each ward with one household farmer having sweet orange orchards. The sample was taken by using simple random method by digging the soil up to 60cm with the help of augers and spade from the soil surface. Three samples were taken from each hole i.e. 0-20cm depth, 20-40cm depth and 40-60cm depth. Altogether 30 samples were collected from 10 household farmers in 10 wards of Golanjor Rural Municipality. Each sample were brought in lab for physio-chemical analysis and parameters like soil texture, soil pH, total nitrogen, available Phosphorus, available Potassium, and Organic matter content were determined. Overall, soil analysis of Golanjor Rural Municipality was found low in Soil Fertility. As per the requirement of sweet orange orchard, nitrogen was found to be the most critical nutrient in Golanjor Rural Municipality, Sindhuli. Farmers have suggested increasing OM content and nitrogen in order to maintain optimum level as per the sweet orange requirement. Researchers have suggested conducting similar fertility assessment researches in the other areas in order to characterize soil and to find out critical nutrient of the area.

**Keywords:** *soil, fertility, status, sweet orange, orchards*

# **PLANT PROTECTION**

## **MAJOR INSECT PESTS OF TOMATO UNDER PLASTIC TUNNEL AND ON FARM MANAGEMENT IN BHAKTAPUR DISTRICT**

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The study entitled “Major insect pests of tomato under plastic tunnel and on farm management in Bhaktapur district” was carried out in four different municipalities of Bhaktapur district from July to September, 2018. Primary data was collected from 90 respondents using semi- structured questionnaires. The surveys revealed that majority of the respondents were male and found in the age group of 30-40 years. Most of the farmers had primary level of education and agriculture was their major occupation. The major insect pests observed in Bhaktapur district was Tuta absoluta, Leaf miner (*Liriomyza trifolii*), Whitefly (*Bemisia tabaci*), Aphids(*Aphis gossypii*) while other insects like Fruit borer(*Helicoverpa armigera*), red spider mites(*Tetranychus urticae*) were rarely seen. The status of Tuta and leaf miner was in increasing trend whereas whitefly was becoming constantly economically important pest. The significance of damage of fruit borer and aphid was in decreasing trend. Only 45% of the farmers were able to identify insects on their own. Forty three percent of the respondents were totally dependent on chemical method of pest management, 30% of respondents on cultural and chemical method, 14% on mechanical method and 13% on botanical methods. Emamectin benzoate, Imidacloprid, Chloropyrifos and cypermethrin, Abamectin, Chlorantraniliprole were mostly used by the respondents. Traps and lures such as yellow sticky traps, TLM lure were used by the respondents. Proper training to the farmers, replacement of chemical pesticides with bio-pesticides and cultural methods with integrated approach and use of chemical as a last resort are always in need in the study area. In general, the community farmers are at the modest level of pest identification and their eco-friendly management practices.

**Keywords:** *insect pests, tomato, plastic, tunnel, Bhaktapur, management]*

## **STUDY ON INSECT PEST OF RICE AND THEIR MANAGEMENT PRACTICES ADOPTED BY THE RICE GROWERS OF THE KAVREPALANCHOWK DISTRICT**

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The study on insect pest of rice and their management practices adopted by the rice growers of the Kavrepalanchowk district was conducted from July to October 2018. Randomly 20 respondents were selected from each three Municipality namely: Panauti, Banepa and Panckhal Municipality. The survey revealed that majority 65% of female were involved in the rice growing. The total population in rice cultivation was between the age group 30-50 years. The farmers of the Kavrepalanchowk district mostly grow Khumal, Taichung and Chinese varieties of rice. The farmer had multiple problems like lack of fertilizers, lack of field sanitation, lack of irrigation facilities, insect pest as well as disease. In the field survey, the insect pest was assessed on visual observations and interacted with the rice growers. Among the insect pest, major economic loss is resulted due to Rice ear-head bug(*Leptocorsiaoratorius*), Rice leaf folder(*Cnaphalocrocismedinalis*) and Rice swarming caterpillar(*Spodopteramaturitia*) along with numerous minor pest. As a control measure, 70% respondents were found dependent on the (traditional) cultural methods as well as chemical methods. 20% of respondents were using chemical i.e. Chloropyrifos, Carboxyl to control the insect pest of rice. On an average, severity of rice ear-head bug was found predominant, ranking in the first score, followed by rice leaf folder in the second rank, rice swarming caterpillar in the third rank while minor pest rice grasshopper was in the fourth rank. The presence of various pests had caused the high yield loss. The source of the seed was mainly from the agro-vets. The recommendation on the time and dose of agro chemicals usage were mainly provided by the technicians and the Agro- vets. The survey revealed that no any kind of management practices were adopted by the rice growers in the study site.

**Keywords:** *insect pest, rice, management, seeds, Kavrepalanchowk*

## **SURVEY OF CUCUMBER DISEASES, PROBLEM FACED AND THEIR MANAGEMENT PRACTICES ADOPTED BY FARMERS IN KATHMANDU VALLEY**

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This study entitled “Survey of cucumber diseases, problem faced and their management practices adopted by farmers in Kathmandu valley” was conducted to evaluate the occurrence of diseases in cucumber and problem faced during cultivation and practices adopted by farmers for their management. Survey of cucumber diseases was carried out in farmer’s field at Kritipur, Nagarjun, Chandragiri and Goldhunga of Kathmandu district, Chagunarayan and kamalbinayak of Bhaktapur district, Mahalaxami, Godawari, Vaisipati and Karyabinayak of Lalitpur district of Kathmandu valley by purposively selecting 105 household. Data were collected by using semi-structured questionnaire. General objective of the study was to identify the cucumber diseases, problem faced and its management practices in cucumber adopted by farmers. It was found that majority of farmers belonged to 30-40 age groups which account 30 percent and talking about the sex of respondents, most of them were males (57) rather than females (43). Most of the farmers were literate 70.5 percent where illiterate 29.5 percent. Agriculture was found to be the main occupation of the respondents. Majority of the respondents were aware of consequences of chemical use where only 29 percent had negative thought towards chemical use. Among 105 respondents many farmers were untrained and few had knowledge on IPM. Various types of disease were seen in the farmers’ field among which viral diseases were mostly seen. Likewise Downy mildew, Powdery mildew and *Anthracnose* diseases caused high amount of economic loss. Farmers used different methods of disease management practices like cultural methods and chemical methods. They sprayed chemicals in the morning. Farmers were unfamiliar about IPM training.

**Keywords:** *cucumber, diseases, problems, management, IPM*

#### **FIELD EVALUATION OF ANAEROBIC SOIL DISINFESTATION (ASD) IN THE MANAGEMENT OF CLUB ROOT DISEASE OF CAULIFLOWER**

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The study was carried out in Majuwa village of Lele, Lalitpur during July to December 2018 to perform the field evaluation of Anaerobic Soil Disinfestations (ASD) in the management of club root disease of cauliflower. The study was comprised of both research trials and survey. The field experiment was conducted in RCBD design with 5 treatments and 4 replications. Five treatments used were: Molasses (T1), Cheuri cake (*Diploknema butyracea*) (T2), Rice bran (T3), Non-amended, covered control (T4) and Non-amended, uncovered control (T5). Parameters like soil temperature, plant height, number of weeds, pH, disease incidence and yield of the crop were recorded. All above parameters were found to be significant ( $p < 0.05$ ) with respect to treatment applied. Maximum temperature was recorded 31.85 °C in T2. Maximum height was also observed in T2 which was 43.8 cm in 60 DAT. Maximum weed number was recorded on T5 with number of 49 per square feet and lowest was on T2 with number of 17. PH was recorded 5.8 as pre- treatment and it became 6.43 in T2 after crop harvesting. Disease incidence was most on T5 with the incidence percentage of 64.58% and lowest on T2 with the disease incidence percentage of 10.42%. Higher yield was found on T2 (33.75 ton/ha) in comparison to other treatments, therefore cheuri cake (T2) was more effective than other treatments in the management of club root disease of cauliflower and also in other plant parameters. A household survey was conducted with 30 randomly selected farmers from Lele, Lalitpur. From the survey we found out that none of the farmers were aware about ASD. Mainly planted varieties of cauliflower were: Kathmandu local, Snow mystique and Dami.

**Keywords:** *cauliflower, club root, treatments, ASD, disease incidence*

#### **STATUS OF INSECT PEST AND DISEASES OCCURRENCE IN GERBERA IN KATHMANDU VALLEY**

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The study was conducted to explore the prevalence of insect pest and disease of gerbera and its management practices in Kathmandu valley conducted from July to September 2018 with the main objective to find out the status of insect pest and disease occurrence in gerbera in Kathmandu valley. Study was conducted among sixteen respondents of Kathmandu valley. During the study, 68.75% of respondents thought that major loss was due to disease, 12.50% was by insect damage and 18.75% of respondents thought that damage was done by both insect pest and diseases equally. For disease, major loss was due to powdery mildew 87.5%, followed by root rot 50%, fusarium wilt 37.5%, crown rot 25% and least by bacterial blight 18.75%, and botrytis 18.75%. For insect, major loss was due to white fly 87.5% followed by leaf miner 50%, cyclamen mites 43.75%, caterpillar 43.75%, aphids 25%, red mites 25%, RKN 12.5%, thrips 12.5% and mollusk 25%. During the study, all sixteen of the respondents were unknown about the disease cycle. Likewise, it was similar condition for life cycle i.e. none of the respondents were acquainted about life cycle of any of the insect. But contrary to that, 81% of the respondents could identify the diseases, and 19% could identify powdery mildew only. Seventy five percent of respondents could identify the insects, 25% could identify frequently occurring insects like white fly and caterpillar. Eighty six percent of the respondents were found to follow physical method of pest management, 56.25% of respondents were found to follow biological method of pest management similarly, 75% of the respondents were found to follow botanical method of pest control while all 100% of the respondents followed chemical method for suppressing the pest. None of the respondents were well trained for insect pest and disease management. Poor knowledge and mishandling of pesticides were seen. Concerned organization like FAN and personnel like extension officer of agriculture ministry should give the training for pest management, safe handling, use of pesticides and harmful effects of it if handled haphazardly and poorly.

**Keywords:** *gerbera, insect pests, diseases, pest management, Kathmandu*

### **IMPACT EVALUATION AND ADOPTION OF INTEGRATED PEST MANAGEMENT OVER CHEMICALS AGAINST TUTA ABSOLUTA IN KAVRE AND LALITPUR DISTRICTS**

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The field study on “Impact evaluation and adoptions of Integrated Pest Management over chemicals against *Tuta absoluta* in Kavre and Lalitpur” was carried out among 140 respondents including 110 household, 20 agro-vets and 10 agriculture professionals from 15th June to 10th October. The study revealed that the active participation in farming was from age group of 21-60 years. Out of the total population of the study, female (61%) participation was found to be more than that of male (39%). Sixty four percent of the populations were dependent in agriculture as a primary occupation. About 32% of the respondents have received training in *Tuta absoluta* and only 22% of the people received training regarding tomato cultivation. Majority of the people who had received training in IPM, Tuta and Tomato cultivation practices were mainly from Development organizations like NGO/INGOs, secondly from CBFs (Community Business Facilitators) and only few from Agro-vets and very few from Government organizations. In Lalitpur, 58% of the total population used IPM and 22% used chemical while in Kavre 22% of the total population used IPM and 88% used chemical for a control of *Tuta absoluta*. Lack of proper training facilities about IPM techniques to the farmers, no availability of IPM tools, lack of co-ordination between research center and extension agent, labor intensive and lack of knowledge about bio-control agents were found to be constraints impeding for the successful adoption of IPM.

**Keywords:** *adoptions, biocontrol, CBFs, chemicals, evaluations, IPM*

### **SURVEY ON INCIDENCE OF TOMATO DISEASES UNDER PLASTIC TUNNEL AND THEIR MANAGEMENT PRACTICES FOLLOWED BY FARMERS IN KATHMANDU VALLEY**

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The study conducted in June-October 2018 was carried out in Nagarjun, Chandragiri, and Kirtipur municipality of Kathmandu district; Mahalaxmi, Godawari and Karyabinayak municipality of Lalitpur district and Chagunarayan, Suryabinayak and Bhaktapur municipality of Bhaktapur district. Primary data were collected from 120 respondents using semi structured questionnaire. From each district, 40 respondents were selected randomly to assess the incidence of major diseases of tomato and their management practices followed by farmers in Kathmandu valley. Secondary data were collected from available literature, books, journals, research papers, HICAST library and Nepal Agricultural Research Council (NARC). The survey revealed that majority of the respondents was male. Regarding the incidence of disease late blight shows higher incidence followed by early blight, virus and other diseases. Farmers used both cultural and chemical methods for management of disease. The survey revealed that majority of the farmer's cultivated Srijana variety in three different districts. Majority of the farmers spray pesticides in an interval of 1 week and fewer farmers spray pesticides in an interval of 3 weeks. To know diseases prevalence, plants were randomly inspected from each farmer's fields. The prevalence of tomato diseases was almost similar in Kathmandu Bhaktapur and Lalitpur district. Commonly used fungicides that are used by farmers are dimethomorph and chlothalonil. The major cause for loss of tomato production may be due to diseases problem and insect problem. i.e 45%, 35% and 42% losses due to diseases in Kathmandu, Bhaktapur and Lalitpur districts respectively. Thirty seven percent, 40% and 38% losses were due to insect pests in Kathmandu, Bhaktapur and Lalitpur districts respectively.

**Keywords; tomato, plastic house, disease, late blight, early blight**

#### **ASSESSMENT OF DISEASES AND INSECT PESTS OF VEGETABLE CROPS AT TAMANKHOLA RURAL MUNICIPALITY OF BAGLUNG DISTRICT OF NEPAL**

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The field survey was carried out from 15<sup>th</sup> June to 18<sup>th</sup> July 2018 to assess the damage and management practices against diseases and insect pests adopted by farmers of Tamankhola rural municipality of Baglung district. Survey was carried among randomly selected 100 farmers by using semi-structure questionnaire. The primary information indicated that male farmer respondents were higher as compared to female respondents. Majority of the respondents were falling under the age group of 31-40 and most of the respondents belonged to Dalit group. Majority of the respondents were found just literate. Male respondents were found to be more educated than female. Agriculture was the primary job of majority of respondents. The major problems for vegetable farming were irrigation problem and infestation of insect pest and diseases. Cabbage butterfly, White fly, Stripped bean weevil, Red ant, white grub, Fruit fly, Red pumpkin beetle, Banded pumpkin beetle and Aplosonyx beetle were major insect pests of vegetables. Likewise, Damping off, *Alternaria* leaf spot, Late and early blight, Bean rust and Powdery mildew were major diseases of vegetables. Only 17 percent of respondents were found using pesticides along with cultural practices to control pests. Thirty eight percent of respondents were using cultural and mechanical methods, 15 percent of respondents were using homemade pesticides and 30 percent of respondents were not applying any control measures. None of them were known about IPM, biological pest management practices and natural enemies.

**Key words: vegetable crop, insect pest, disease, pesticide, Baglung**

#### **PHTHORIMAEA OPERCULELLA IN STORAGE CONDITION AND ITS EFFECT ON FARM MANAGEMENT IN PANAUTI MUNICIPALITY**

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The study entitled "Study on the damage of the potato tuber moth (*Phthorimaea operculella*) storage condition and its effect on farm management in Panauti Municipality" was carried out in Panauti Municipality of Kavre district. Study was carried out from June-September, 2018. Primary data was collected from 111 respondents using semi

structure questionnaire and the respondents were chosen randomly to assess the status and occurrence of potato tuber moth and management practices adopted by farmers of Panauti municipality. Secondary data was collected from available literature, books, journal, research paper, HICAST library, and Nepal Agriculture Research Council (NARC). The survey revealed that majority of the respondents was female. Regarding the insect pest, potato tuber moth (PTM) had highly infested the stored potato of these area and caused economic damage. Farmers use cultural, botanical and chemical methods as a pest management strategy. Most of the farmers use traditional botanicals for PTM management during storage condition. Titepati (*Artemisia sp.*) was the most commonly used botanical pesticide and was also claimed to be the most effective plant against PTM by farmers of all locations. Farmers mainly used the botanical methods to control PTM because the stored potato was mainly used for consumption purpose. About thirty percent of the respondents used chemical methods for controlling the pests. Commonly used insecticides that are used by farmers are malathion, cypermethrin, metacid, copper sulphate powder, chloropyrifos, dimethoate. Most of the farmers were found to follow their traditional methods rather than new developed ones. None of the respondents were found to use pheromone traps or other advanced management techniques because of the tediousness and inconsistent appearance of the PTM. Similarly, lack of training among the potato cultivating households also led to the lack of adoption of proper management techniques for the PTM. Only (16%) knew about the color indicator on the packets or cans of the chemical pesticides and were found using them without knowing the extent of the harm that can be done by those chemicals.

**Key words:** *farmers, management, potato, PTM, chemicals*

## **COLLECTION AND IDENTIFICATION OF WILD MUSHROOMS FOUND IN DIFFERENT ECOLOGICAL REGIONS OF NEPAL**

**Rukshana Thapa**

This investigation provides the information on identification of wild mushrooms that are found in different ecological regions of Nepal. Identification of wild mushrooms was conducted during August to September 2018 to find out the availability of wild mushrooms in forest of Chitwan, Khaptad, Nagarkot and Suryabinayak. In Nepal only few species of mushrooms are cultivated for economic purposes. Forests are filled with wild mushrooms in rainy season among which some are edible, some are inedible whereas some are poisonous and can kill an individual if consumed without proper knowledge. Wild mushrooms were identified by generalizing the physical characters of mushrooms such as cap shape, surface, color of mushroom, stipe characters, spore print and media on which they are growing which were then identified by using primary sources. The result of this study indicated that out of 130 species of wild mushrooms collected, 92 species were identified whereas 38 species remained unidentified. Out of those 92 identified mushrooms, 35 species were found to be edible, 25 species are inedible due to look alike, taste preference and polypore which have crusty and woody surface. Three species of wild mushrooms found in Suryabinayak are reported to have medicinal values and 4 species are reported to have psychoactive compounds. Among 92 identified mushrooms, 8 different species of mushrooms are found to be poisonous and can be distinguished by screening the physical characters including smell. This study indicates the need of proper literature and books that provides information about wild mushroom including photographs and characters that will ease the identification process.

**Keywords:** *wild, mushrooms, ecological, regions, collection*

## **PRACTICES ADOPTED BY THE FARMERS FOR THE MANAGEMENT OF WHITEFLIES ON TOMATO CULTIVATED IN PLASTIC TUNNELS IN BHAKTAPUR DISTRICT**

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The present study was carried out from 14th September to 27th November, 2018 to assess the management practices of whitefly in Bhaktapur district, Nepal. A survey was carried out among 90 tomato growers from four municipalities Changunarayan, Suryabinayak, Bhaktapur and Madhyapur Thimi using semi-structured questionnaire. The survey revealed that majority of the respondents was of the middle age category (30-50) years

and with primary level of education. Farmers of Bhaktapur district mostly grow Srijana variety followed by Samjhana. Only some respondents had knowledge about Integrated Pest Management. The study showed that seventy eight percent of the respondents reported that the status of whitefly has decreased from previous year. Biological method of pest management was not used by any of the farmers due to lack of availability and technical know-how. Some farmers were found to be planting trap crop such as marigold, eggplant, cowpea on the border of tomato field which help to reduce whiteflies infestation. About sixty eight percent followed cultural and mechanical practices, forty nine percent used botanical pesticides and eighty one percent used chemical pesticides for the management of whitefly. Commonly used insecticides that are used by farmers are chloropyriphos, cypermethrin, acetamiprid, imidacloprid. Tomato growers having knowledge about IPM method read label of pesticides ( $p < 0.05$ ) and there was significant interaction between municipality and management practices of whitefly.

**Key words:** *integrated pest management, plastic tunnel, trap crop, whitefly, tomato*

## STUDY ON REACTION OF TOMATO VARIETIES TO BACTERIAL WILT

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Bacterial wilt caused by *Ralstonia solanacearum* is one of the destructive diseases of tomato. Experiments were conducted to evaluate varieties found in local market as well as some varieties from Plant Pathology Division, NARC through seedling screening. Seedling screening is one of the time saving and less resource using techniques. A total of fifteen varieties were included in the experiment. Randomized complete block design with 3 replications was commenced in inoculated conditions under screen house at Plant Pathology Division, NARC, Khumaltar. Inoculation was done with drenching of bacterial suspension having 0.3 OD ( $10^7$  cfu per ml) at 600 nm at the ratio of 1:10 v/wt. In terms of disease incidence Amrapali and Pusa Ruby were found to be the most susceptible varieties and Dalila the moderately resistant variety in both the experiment. Repeated experiments showed slight variation in disease reaction of the varieties to bacterial wilt. However, combined results of two experiments showed, out of 11 varieties one was found moderately resistant, 6 moderately susceptible and 4 were found susceptible. However, the selected resistant or moderately resistant varieties then could be taken in the field conditions to verify their disease reaction level. Moderately resistant varieties could be used in integration with another management options for the management of bacterial wilt disease.

**Key words:** *bacterial wilt, Ralstonia solanacearum, resistant variety, tomato, management*

## MAJOR INSECT PESTS OF CUCURBITS AND THEIR MANAGEMENT PRACTICES IN LAMJUNG DISTRICT

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A study was carried out from June 23 to August 25, 2018 on major insect pests of cucurbits and their management practices adopted in Lamjung district. A total 95 farmers were interviewed randomly from Dhamilikuwa, Baanjhakhet, Khudi, Tarkughat, and Gairi areas. It was found that majority of farmers belong to 30-40 age groups which accounts 33% and most of them are males. The study showed that there were many insect pests attacking cucurbits family, like fruit fly, red pumpkin beetle, aphid, whitefly, Epilachna beetle, cucurbit sting bug, cutworm, and blister beetle. Among them fruit fly showed higher incidence followed by aphid and red pumpkin beetle causing high economic losses. Aphid and blister beetle are also causing losses in the field and whereas insect pests like whitefly and cutworm were found very few in numbers. However attempts were made by farmers to reduce the damage. Farmers were found using mechanical and chemical methods as pest management strategies. About thirty five percent of respondent used chemical methods for controlling the pests. Twenty six percent of the farmers were using mechanical methods. For mechanical method they were using sex pheromone traps to lure insects. In case of use of botanicals as pesticides they were using neem (*Azadiracta indica*), asuro (*Justicia adhatoda*), bakaino (*Melia azedarch*), titepati (*Artemisia spp.*) and other local botanicals. The commonly used synthetic insecticides by farmers were Dicholorovos, Cypermethrin, Dimethoate, Malathion and Endosulfan. The indiscriminate use of chemical

pesticides has resulted pest resistance, resurgence and sometimes outbreak. Majority of farmers were unaware about other methods of pest management except chemical methods.

**Key words:** *cucurbits, insect pest of cucurbits, pesticides, management*

### **STUDY ON EFFICACY OF TRICHODERMA AGAINST RHIZOCTONIA SOLANI ON CABBAGE (SEEDLING ASSAY)**

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The study entitled “Study on efficacy of *Trichoderma* against *Rhizoctonia solani* on cabbage (seedling assay)” was conducted to explore the effectiveness of different products of *Trichoderma* against the disease caused by *Rhizoctonia solani* on cabbage under screen house at Plant Pathology Division of NARC. Disease recording values were progressively changing from 1st to 6th recordings. This study consists of 8 treatments which were replicated thrice in Randomized Complete Block Design (RCBD) under screen house conditions. The treatments used in the experiment were the commercial product of *Trichoderma* (Sanjevani, Tricho-HR and Biocide trivi), the isolates present at PPD, Khumaltar (T260, T69 and *Trichoderma viride*), Bavistin (Chemical as check) and control. Diseases were recorded based on the wirestem symptom and lesion length. Different growth parameters such as Plant height, no. of leaves and biomass along with mortality percentage were also recorded. Based on the disease and growth parameters, the treatment *T. viride* was found most effective. Other treatments such as Tricho-HR and Sanjevani compared to Bavistin and other treatments were found to have similar efficacy against *Rhizoctonia solani* as shown by *T. viride*. Biomass in *T. viride* treated cabbage plants was observed highest (320 gm) compared to other treatments. Hence, *T. viride* could be used to reduce the wirestem disease of cabbage however further verification in the field condition is required for confirmation.

**Keywords:** *Trichoderma, Rhizoctonia solani, Trichoderma viride(TV), biomass, cabbage*

### **STUDY ON FARMER’S PEST MANAGEMENT STRATEGY, KNOWLEDGE ON PESTICIDE SAFTEY AND PRACTICE OF PESTICIDE USE AT BHAKTAPUR DISTRICT**

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The study entitled “STUDY ON FARMER’S PEST MANAGEMENT STRATEGY, KNOWLEDGE ON PESTICIDE SAFTEY AND PRACTICE OF PESTICIDE USE AT BHAKTAPUR DISTRICT” was conducted to know the pest management strategy, knowledge and practice of pesticide use at Bhaktapur. The study was conducted from June to August 2018. A total of 100 respondents were interviewed, 25 from each municipality of Bhaktapur district. As a major activity, questionnaires were asked to the farmers. The survey revealed that thirty-five percent of respondents, the highest proportion, used a chemical with other methods whereas 28 percent of people used chemical only as the pest management strategy. Farmers with higher level of education used pesticides after the pest emergence ( $\chi^2=104.47$   $p<0.05$ ). The awareness regarding pesticide use was more frequent with people with knowledge on IPM ( $\chi^2=79.396$   $p<0.05$ ). The study found that mostly the respondents used the pesticide in the vegetable crops followed by the cereal crops. The least amount of pesticide was used in the fruit tree crops, accounting only 10 percent of the total pesticide used in the field. The study found that 45 percent of farmers spray pesticides after the damage is seen in the plants, whereas 34 percent farmer responded that they spray pesticides after pest appearance. Similarly, 21 percent of farmers responded that they use pesticides before the pest and damage is seen. Thirty seven percent of respondents said that they spray 1-4 times per season. Thirty four percent of respondents said they spray pesticides 4-8 times, whereas 28 percent of respondents said that they spray pesticides more than 8 times per season. It was found that mostly farmers depend on agro-vet recommendations to combat the pest and disease incidence.

**Keywords:** *pest management, farmers' knowledge, pesticides use, practice, safety*

### **ASSESSMENT OF ORGANOPHOSPHATE AND CARBAMATE RESIDUES IN STORED POTATO OF KAVRE, NEPAL**

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This study entitled “Assessment of organophosphate and carbamate residues in stored potato of Kavre, Nepal” was carried out in 3 different Municipalities of Kavre i.e., Banepa Municipality, Panauti Municipality and Panchkhal Municipality from 15th June to 18th November, 2018. Simple Random Sampling (SRS) technique was employed to select the designated number of respondents for survey and sample collection. Ninety seven percent of respondents were selected for the interview and questions were asked on the basis of questionnaire. About 0.7 kg to 1 kg potato samples were collected from same households for laboratory analysis in RBPR lab, Kalimati. In surveyed area, both the gender was found to be involved in potato production with majority of them between the age group of 36-45. Although most of the respondents were illiterate, 62% of the respondents identified the storage pest of potato on the basis of their traditional knowledge and others with the help of agro-vets and JTAs. The result showed that the major insect pests of surveyed site were potato tuber moth with range of damage between 0-75% and mostly chemical pesticide was used for its management. Around 64% of farmers were unaware about indicator label of pesticide while only 27% were unaware about the pesticide doses. About 78% of the respondents used chemical pesticide before and immediately after incident of pest. Although all of the respondents had proper sanitation after the use of chemical pesticides, there was not safe storage of pesticide. Around 52% of farmers were unaware about the waiting period of pesticide. Although 97% of the farmers were well aware of the health impact caused by the pesticides, ninety of the farmers dispose the container haphazardly near riverside and open area. Around 45% of the respondents also reported to have minor health issue during and after application of chemical pesticides. Laboratory analysis revealed that the inhibition percentage of carbamate and organophosphates of all the surveyed area was below 35% which means the stored potatoes was safe for consumption.

**Keywords:** *farmers, potato, pest, pesticides, Kavre*

### **DAMAGE ASSESSMENT AND MANAGEMENT STRATEGIES ADOPTED BY FARMERS AGAINST *TUTA ABSOLUTA* IN TOMATO GROWING AREAS OF KATHMANDU, LALITPUR AND KAVRE DISTRICTS**

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Vegetable farming has become a profitable business in terai, mid-hills and other subtropical belts of Nepal. Dahachowk, VDC of Kathmandu district, Lele, VDC of Lalitpur district and Panauti, VDC of Kavre district were selected for the study in the Bagmati Zone of Province 3. Study consisted of two major parts: assessing the damage and management strategies adopted in Kathmandu, Lalitpur and Kavre; and farmers survey (120) in those districts. A study was carried out from June to September, 2018 in order to assess the damage and to identify management practices adopted by farmers against *Tuta absoluta* (South American Leaf Miner) in Kathmandu, Lalitpur and Kavre district. A field experiment was setup using different treatments to analyze the effectiveness of treatments regarding infestation in leaf, shoots, fruit as well as yield. The treatments T1 (Chemical), T2 (TLM lure), T3 (IPM methods) and T4 (Control) were compared with each other. For the monitoring of adult moths, Wota -T trap with TLM lure was installed and moths were recorded on weekly basis. The population of adult moths ranged from 30 to 270 in each Wota T-Trap. In the study infestation percentage of leaf, shoots, fruits and effect of treatments on yield were observed with the treatment. Highest infestation percentage was obtained in Control plot (T4) in all parameters i.e., leaves, shoot, fruit and yield loss. In all aspects of research IPM (T3) showed the effective result than any other treatments. The chemical pesticides used included Emamectinbenzoate, Chlorantraniliprole and Biopesticides like Dadaguard and sex pheromone, TLM lure was also used. The Integrated Pest Management trained farmers were much aware about the safety wares as well as impact of IPM over chemical in long run within eco-system.

**Key words:** *tomato, Tuta absoluta, treatment, chemical, IPM, TLM lure*

## **EFFICACY OF *METARHIZIUM ANISOPLIAE* AGAINST WHITE GRUB**

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This research “Efficacy of *Metarhizium anisopliae* against White grub” was conducted at HICAST laboratory, Sanepa, Lalitpur for nearly three months. The main objective of the research was to observe the effectiveness of different doses of *M. anisopliae* over white grubs. For this, white grub larvae were collected from Tupikhel, Godawari Municipality-3, Lalitpur and the *M. anisopliae* was brought from agro vet of Lagankhel. A total of 200 white grub was collected, reared, and 180 were selected for research. Two methods were used for the study (insect dipping method and drenching method), and 90 insects were treated in each. The experimental design was CRD (Completely randomized design). Six treatments (0.25ml, 0.5ml, 1ml, 2ml, 3ml per 100ml water each and control) were made, and in each treatment, 15 larvae were treated. Data were collected and entered in MS-Excel; analysis of data collected under laboratory experiment in Completely Randomized Design was done by using GenStat Discovery Edition 4 for the one way analysis of variance (ANOVA). In both the methods, results were significant showing higher dose of biopesticide i.e. *M. anisopliae* 3ml/100ml water cause significantly higher mortalities and infection rate, and the recommended dose shows no significant difference than control which might be due to loss of virulence during manufacturing, transportation and storage process or host and pathogen adaptation or environmental factors. *M. anisopliae* have wide range of host and can be proven as novel practice of white grub management if this bio-pesticide could be commercialized and manufactured widely within the country.

**Keywords:** *Metarhizium anisopliae, white grub, biopesticide, mortalities, efficacy, pathogen, host, infection.*

# **SUSTAINABLE AGRICULTURE**



## **STUDY ON SUSTAINABLE LIVELIHOOD SITUATIONS OF FARMERS IN KANAKAI, JHAPA**

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A study on sustainable livelihood situations of farmers in Kankai was carried out from June to August 2018 covering a total of 100 Households. Questionnaire survey, focal group discussion, key informant interview, observations and various relevant publications were used as a source of information. The area was dominated by Brahmin- Chettri. Seventy percent of the respondents were found literate. Majority of the families were nuclear. Ninety seven percent households (HHs) were male- headed. Fifty three percent of the respondents depended only on agriculture for their livelihood. Maximum HH made more than NRs. 15,000 monthly. Everyone had access to decent toilet, drinking water and electricity. Majority of HHs possessed mobile phone and television. Almost none of the HHs had any internet services but if present only educated or young people used internet. More than 50 percent of the respondents were small land holders. Main crops grown in the area were rice, maize, mustard and vegetable crops like pumpkin, sponge gourd and lady's finger. Irrigation was entirely rain-fed. Eight five percent of HHs were categorized as food secure, 5 percent were moderately food insecure and 10 percent were severely food insecure. Working labor was not available easily. People had access to agricultural and veterinary services but no access to hospitals in need of time. Only 54 percent of the total respondents reared livestock. Normally, females did the household tasks. Only 7 percent of the total household had working women. Commonly, both sexes were involved in agricultural activities.

**Keywords:** *sustainable, agriculture, livelihood, organic farming, Jhapa*

## **STUDY ON DIFFERENT VARIETIES AND AGRONOMIC PRACTICES OF RICE ADOPTED BY FARMERS OF BHAKTAPUR DISTRICT**

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A study on varieties and agronomic practices in rice adopted by farmers of 6 ward areas of Bhaktapur district namely Balkoti, Changunarayan, Dadhikot, Duwakot, Thimi, and Gathaghar was conducted from 20 August to November 4 2018. A total of 100 respondents were selected through random sampling. Questionnaire survey, group discussion, interview, observation were used for information collection. Thirty five percent respondents were literate with 50% primary, and 12 % secondary education, 3 % Bachelor level of education respectively. About 70 percent of respondents had some technical knowledge. The land holding of the respondents starting from less than 2 ropani was 60 %, 30% respondents had 2-5 ropani land and 10 % respondents had land more than 5 ropani. The farmers cultivate rice for self-consumption but as many products can be made like beaten rice, local liquor, and local varieties also can be used as seed for next transplantation. Locals of Bhaktapur were completely satisfied with the variety they have been using since long period and also started to cultivate hybrid varieties and achieved satisfactory result with varieties like Chinese hybrid DY 18,DY 28,DY 69 and farmer normally term hybrid rice as Eklodhan. Mansuri local varieties are also the preferred ones where improved varieties like Khumal 4, Khumal -8, Chainung - 242 were common variety people have been growing since many years. Farmers were unknown about System of Rice intensification technique. Seed rate for local varieties were 80kg/ha and 20 kg/ha for hybrid. Most of the respondents applied combination of Urea (ammonia), DAP (ammonia and Potash), MOP (Potash) 52 % and respondents using cattle and poultry manure were 37% and 11% respectively. Source of Irrigation were irrigation canal 20%, (groundwater+rain water) 45% and ground water 35%, 80 % hand weeding and 20 % respondents used herbicides like (Butachlor).

**Keywords:** *varieties, agronomic, practices, rice, Bhaktapur*

## **COMPREHENSIVE STUDY ON VALUE CHAIN OF RICE IN KANKAI MUNICIPALITY, JHAPA**

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A study was conducted to analyze the value chain analysis of rice in Jhapa district of Nepal. A pre-tested questionnaire was administered to 80 randomly selected respondents from different level of value chain actors as well as focus group discussion (FGD) from middle of May to June 2018. Based on the data obtained from the survey it can be concluded that the cultivation practices were adopted as a practice rather than commercial basis. The average cost of production for 1 ha of land was calculated to be NRs. 43,333 and the gross return was NRs. 69,146 with the gross margin of NRs. 26,812. The benefit cost ratio was 1.6. The positive benefit cost ratio indicated the rice cultivation as profitable enterprise in the study area. The producers' share was calculated to be 50% and price spread was NRs. 22 with the highest profit margin for millers, followed by wholesalers and retailers. The major value addition activities included drying and milling processes (cleaning, de-husking, polishing, grading, and packaging). The price determination was done by the village traders and collectors with price fluctuation caused by the imports of cheap low quality rice from Indian markets. Different constraints were identified as inadequate input supply of quality seeds and fertilizers, poor irrigation facilities, high labour cost of production, land fragmentation as well as poor technical support and limited marketing facilities. The proper supply of inputs as well as proper irrigation facilities during dry seasons can significantly increase the horizon of rice cultivation. The concept of collective farming and proper storage facilities can significantly reduce cost of production and fetch good prices during scarce season.

**Keywords:** *rice, value chain, constraints, value addition, Jhapa*

## **ROOFTOP FARMING AND ITS ROLE IN ORGANIC VEGETABLE PRODUCTION AND FOOD SECURITY IN KATHMANDU VALLEY**

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A study on rooftop farming and its role in organic vegetable production and food security was conducted during July to August 2018 in Kathmandu, Lalitpur, and Bhaktapur districts. The findings were based on the perception, knowledge and experience of purposively selected 105 households of which 35 were from Kathmandu, 35 from Lalitpur and 35 from Bhaktapur. This study included semi- structured questionnaire, field visit and observations of rooftop gardens. Both male and female respondents have involved in rooftop farming but maximum were females. Both youth and old Age (above 60 years) people were engaged in rooftop gardening. Many of the respondents have started rooftop farming because of having interest in farming. The rooftop farming had been practiced since 18 years and is in increasing trend in the study areas. In the survey area 14% in Kathmandu, 23% in Lalitpur and 25% of respondents in Bhaktapur have kitchen garden. Eight percent respondents in Kathmandu, 12% in Lalitpur and 8% in Bhaktapur had saved up to NRs. 3000 or more from rooftop farming. Majority of the respondents, 88% in Kathmandu, 92% in Lalitpur and 72% in Bhaktapur had practiced mixed type of farming systems. Majority of the respondents 98% in Kathmandu, 96% in Lalitpur and 97% of the respondents recycled containers, sacks for growing crops in their rooftop gardens. 91% in Kathmandu, 92% in Lalitpur, 83% of the respondents in Bhaktapur decompose kitchen waste for composting in compost bin. Thirteen percent in Kathmandu, 14% in Lalitpur and 16% in Bhaktapur used chemical pesticides for controlling insect pest and diseases and remaining percentage used home-made pesticides, bio-pesticides and some use plastic bags for covering fruits, pheromone traps, and yellow sticky traps. The rooftop farming provides fresh organic commodities in people's own house.

**Keywords:** *rooftop farming, organic vegetable, food security, commodities, fresh*

## **EFFECT OF AGE OF SEEDLINGS OF DIFFERENT RICE VARIETIES IN GRAIN YIELD IN SIRAHA DISTRICT**

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A study on effect of age of rice seedlings of different rice varieties in grain yield in Siraha District of Nepal was carried out from July 19 to December 5 of 2018. The seed used in the research field were collected from the NARC Regional Agricultural Research Station, Parwanipur. There were five varieties where the plantation was done in the same environment. The total area of the experimental plot was 180m<sup>2</sup> (30m × 6m). The area of each block was 9 m<sup>2</sup> (3m \* 3m). The space between two blocks was 0.6m and space between the plots was 0.4 m. This research revealed that Arize 6444 rice variety showed highest number of tiller (31) at 65 days seedling. This same variety Arize 6444 also showed the highest plant height (87) cm. The variety Ram dhan showed that 65 days seedling produced the highest panicle length (28) cm. The Swarn sub- 1 variety with 55 days seedling gave the highest number of plant with panicle (14m<sup>2</sup>) while Radha -4 variety with 55 days seedling produced highest seed weight (26.6g) whereas Swarna sub -1 variety with 50 days seedling produced lowest test weight (12g), the Swarna sub-1 variety with 25 days seedlings (normal seedling) resulted in the highest grain yield 6274 kg/ ha whereas Swarna sub-1 with 50 days seedling resulted in the lowest grain yield 998 kg /ha.

**Keywords:** *rice seedling, paddy yield, rice cultivar, better varieties, Siraha*

#### **ASSESSMENT OF EXISTING AND POTENTIAL CROPPING SYSTEM FOR CROP YIELD IMPROVEMENT AT TAMANKHOLA RURAL MUNICIPALITY, BAGLUNG**

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The study was conducted from 10th June to 15th of September 2018 to identify the existing and potential cropping systems for crop yield improvement in Tamankhola Rural Municipality (TMR), Baglung district. A total of 100 households were selected randomly comprising of six wards of TMR. The study showed that female population involvement was more in agriculture than male. Almost 95 percentages of farmers were involved in agriculture sector. About 85% of the farmers have got < 1 ha of land. The study showed that most of the farmers at study area were small marginal farmers. The mostly adopted cropping system practices were Maize-Potato cropping system (30%). The main potential cropping system of this area is potato based cropping system since the average yield of potato is higher (18 ton/ha). Most of the households depended on rainfall for irrigation but very few farmers (<10%) have canal passing nearby their farm. 15% of the households applied chemical fertilizers for the cultivation of crops. Manakamana-4 was the most prominent varieties of maize grown by most of the farmers. Mostly grown varieties of wheat, barley and potato were Kanchan, Gautam and local, respectively. The disease incidence of leaf rust, brown spot and blight were found in wheat, maize and potato, respectively and insects' incidence of red ant and white grub were occurring in potato and maize, respectively. Only 5% of the farmers in this Rural Municipality were well known about sustainable agriculture. Maximum number of farmers has faced the problem of insufficiency of food, as their farm production was not sufficient to fulfill the food needs of their family members.

**Keywords :** *cropping system, maize, potato, yield, improvement*

#### **ASSESSMENT OF INTEGRATED PEST MANAGEMENT PRACTICES AND INCIDENCE OF INSECT PESTS OCCURRENCE IN VEGETABLE CROPS IN CHANDRAGIRI MUNICIPALITY**

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A study on assessment of integrated pest management (IPM) practices and incidence of insect pest occurrence in Chandragiri Municipality was carried out to document and analyze various pest management practices adopted by farmers who have participated in IPM-Farmer's Field School. The study was conducted in Chandragiri Municipality, Kathmandu district from 20<sup>th</sup> July to 20<sup>th</sup> of November 2018. The survey was conducted with the semi

structured questionnaire interview with total 70 sample population selected by stratified random sampling method of farmers who have participated in IPM -FFS. The study revealed aphids and cutworms as the major pest in vegetable crops. Most of the respondents were found using Jhol mal (57%) and Bokashi mal (53%). The study showed that 57.2% of respondents were using chemical pesticides as suggested by agro-vet technician. Some respondents (11.5%) reported using pesticide dose as per label on the bottle and 31.5% used the chemical pesticides on their own way. The use of mixed cropping system was more than the crop rotation for the control of pests. The use of eco-friendly tools of pest management such as microbial based bio-pesticides, light traps, pheromone traps and yellow sticky traps was high because they have sufficient knowledge about it. Most of the farmers in the study sites had positive attitude toward IPM program and were found interested in adopting IPM practices but lack of necessary knowledge had become an obstacle. The study depicted the need to communicate the farmers about the safe production with maximum utilization of IPM tools as it seemed to have positive impact on yield.

**Keywords:** *FFS, IPM, Pest, vegetable, crops*

### **BEEKEEPING IMPACT ON FARMER'S LIVELIHOOD AND FOOD SECURITY IN DANG DISTRICT**

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A study on impact of beekeeping on farmer's livelihood and food security in Dang district was conducted from August to November 2018. The survey primarily depended on questionnaire interview. With consideration of density of farmers per area, 123 samples were randomly chosen as respondents. Dang district have more than 800 beekeepers, producing more than 320 MT of honey per year almost 80% of which is exported out of the district. Female were hugely outnumbered by male and 21% of respondent were illiterate. Eighty one percent of respondents had *Apis mellifera* bee, with average production of 19 Kg. Remaining 19 % respondent practiced *A. cerana*, with average production of 8 Kg per hive. The price of honey was around NRs. 400/Kg and 750/Kg respectively. Almost all beekeepers with *A. mellifera* did seasonal migration of their beehives ranging from 5Km to 200Km. Around Sixty four (63.7%) of respondents made more than 2 lakhs last year. Around 30 percent (29.7%) of male earned less than 2 lakhs while 50% of female earned such amount. Thirty eight percent of respondents had 20-50 beehives, while 34% of respondent produced less than 5 quintals of honey. More than half respondents started beekeeping more than 10 years ago. Thirty one percent of the farmers had more than 100 beehives. Forty percent of respondents provided employment to one or more people. Eight three percent of respondents spent major chunk of income from beekeeping for household and food. Food security status of 69.5% respondent was found good, 17.2% household were mildly food insecure. While 10.9% households were moderately food insecure, 2.4% household faced severe food insecurity.

**Keywords:** *beekeeping, dang, honey, food security, households*

### **ADAPTATION TO CLIMATE CHANGE: PERFORMANCE OF RICE VARIETIES IN BANKE DISTRICT**

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This study was conducted to analyze likely effects of climate change and agriculture management information system (AMIS) impact on rice production in Banke district. Open top chamber system was designed for conducting research into rice crop response to increased temperature for which 5 different rice varieties (Radha-4, Sukkhadhan-3, Sukkhadhan-2, IR83383-G-B-141-1 and IR87751-20-4-4-2) were transplanted. Three temperature conditions were used: ambient condition, open top chamber with 1.2m and 1.5m height enclosed from base with plastic sheet. Sukkhadhan-2 significantly ( $p$  value= 0.0199) produced higher grain yield 4.33 t/ha under chamber condition in contrast to open field (2.93 t/ha) as well as significant ( $p$  value=0.01751) higher biomass yield 13.62t/ha under elevated temperature. In the context of climate change and its adaptation in rice agriculture, a questionnaire survey was conducted among 35 AMIS supported farmers and 39 general farmers using mobile application

'KoboCollect'. The results showed that AMIS farmers were less dependent on rain for irrigation (p value = 0.058, 34% compared to 56% general farmers). Knowledge of drought resistant rice varieties was significantly (p value <0.0001) higher among AMIS farmers (91%) compared to general farmers (46%). AMIS farmers were significantly (p value <0.0001) more benefited by government organizations on climate change knowledge than general farmers (3% only). The consideration of crop varieties, installation of early warning system and irrigation channels are adoption measures to minimize the incidence of climate change in farming system.

**Keywords:** *open top chamber, rice, AMIS, climate change, Banke*

## **ORGANIC FARMING AND ITS ROLE IN INCOME GENERATION AND LIVELIHOOD IMPROVEMENT OF FARMERS IN SOME MUNICIPALITIES OF KATHMANDU**

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A study on organic farming and its role in income generation and livelihood improvement of farmers in some municipalities of Kathmandu district was conducted with randomly selected 60 households. Kathmandu has faced high numbers of immigrants from rural areas. Currently 2.5 million people reside in Kathmandu, the population increases by 4% each year and it is considered as one of the most rapidly urbanizing regions in South Asia. By facing these problems, most of the farmers had organic farming due to their knowledge about the negative impact of chemical inputs and the scope of organic vegetables in nutrition and health. Major growing vegetable crops were cauliflower, cabbage, beans, bitter melon, bottle gourd, pumpkin, chilli, cucumber and some leafy vegetables. Twenty five percent of respondents had sufficient manure for their farm and the remaining 75% did not have sufficient manure from their livestock farm for vegetable production. Farmers needed to buy organic manures from outer sources. It is noticeable that 66.66 percent of the respondents (N=60) were engaged in organic vegetable production primarily for home consumption, which is an indicator of their awareness to health, 25 percent of respondents were engaged on organic vegetable farming due to nutrition awareness and the rest 8.33 percent of respondents were participating in organic farming due to its ecological reasons. The study revealed that out of 60 respondents 16.66% earned annual income of NRs.10000-25000, 5% respondents earned NRs. 25000-40000, and other 5% respondents earned NRs.40000-55000 depending on the size of farm. Furthermore, the respondents reported that they were happy and satisfied with organic vegetable production. Forty two percent of respondents reported that the yield of vegetable production was in increasing, trend, 25 percent of respondents reported that the yield was in decreasing trend and 33 percent of respondents reported that production trend was constant.

**Keywords:** *organic farming, income generation, livelihood improvement, farmers, Kathman*

## **ASSESSMENT OF THE IMPACT OF POTATO BASED CROPPING SYSTEM ON LIVELIHOOD AND INCOME GENERATION AT TAMANKHOLA RURAL MUNICIPALITY, BAGLUNG**

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An assessment of the impact of potato based cropping system on livelihood and income generation in Tamankhola Rural Municipality, Baglung district was conducted during 15<sup>th</sup> June to 18<sup>th</sup> July, 2018 using research tools such as questionnaire interview, focus group discussion, direct observation and review of literatures. Altogether 100 households (HHs) were selected for this study through simple random sampling method. The study showed poor access of HHs to assets. Primary source of income in Tamankhola was agriculture and animal husbandry followed by remittance. The potato based cropping system in Tamankhola Rural Municipality is very unique as they cultivated potato without making bunds and maize seed are sown in the same field after 2 months. Despite potato having great potential to serve in food security and nutritional value, less attention has been given to launch the program to improve and increase the production of potato. Lack of improved variety was found as the common problem of the potato producing farmers. Beside this, there is lack of good working relationship and coordination with technical service provider, like DADO, and entrepreneur, good marketing environment, good transportation facility, and proper storage facility in the study area. It was found that income of the potato farmer was minimum

NRs. 15000 and maximum was NRs. 300000 in a season. Very few farmers cultivated potato twice in a year. Most of the households have used the income in house expenditure and also spending their income in children's education, to pay debt, improving agricultural field, buying new land and constructing new houses. All these factors are definitely positive trends of improvement in the livelihood of farmer, which potato cultivation have made possible. Potato cultivation has increased the income of the farming households and is contributing to the utilization of income in various activities.

***Key words: potato, livelihood, food security, cropping system, Baglung***

## **YIELD PERFORMANCE OF PROMISING VARIETIES OF POTATO AND THEIR ECONOMIC ANALYSIS OF BANEPA MUNICIPALITY, KAVRE**

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The yield performance of promising varieties of potato and their economic analysis was conducted in Banepa of Kavre district during August to September, 2018. Semi-structured questionnaires, interview, focus group discussion, direct observation and review of literatures were used as research tools. Altogether 100 households (HHs) were selected for this study through simple random sampling method for field survey. The study showed poor access of HHs to assets. Primary source of income was agriculture and animal husbandry followed by remittance. The lack of improved variety was found as common problem of the potato producer farmer. Besides this, lack of good working relationship and coordination with DADO and entrepreneur, good marketing environment, good transportation facility, proper storage facility were found to be constraints for farmers. Some farmers also cultivated potato twice a year. Most of the HHs have used the income in house expenditure, and spent their income in children's education, health, saving and other activities. Potato cultivation has increased the income of the farming households and enabled them for utilization of income in various activities.

***Keywords: potato, yield performance, potato varieties, economic analysis, Banepa***

## **ROLE OF ORGANIC AGRICULTURE IN FOOD SECURITY AND LIVELIHOOD AT TAMANKHOLA RURAL MUNICIPALITY, BAGLUNG**

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The present survey on role of organic agriculture on food security and livelihood at Tamankhola Rural Municipality (TMR) was conducted in Baglung district. The general objective of the survey was to assess the food security status and livelihood of households through the help of organic agriculture. The method of survey was mainly focused on collecting data by directly interviewing targeted groups such as farmers, consumers and traders through random selection. The study was carried out from 15<sup>th</sup> June to 17<sup>th</sup> August 2018. During the survey all 6 wards with 25 villages of TMR were studied. The total sample size was 100 consisting of every types of farmers (subsistence farmers and commercial farmers). It was found that there were mainly subsistence farmers growing agricultural products for their own consumption. The places of TMR are not supposed to be cultivated during the last six months of the year because of natural calamities like heavy wind, frost and hailstorm. The products grown at first six is used at that time. The cost of cultivation of organic farming in comparison to conventional farming was found cheaper but productivity was found to be less. Although the production is low, food security can be obtained because farmers get high price for their products and they can compensate with other nutritious food. So there is necessity of market driven commercial production of organic commodities. Farmers were attracted towards organic vegetable production only for home consumption because of low chemical fertilizers and pesticides exposure and sustainability of their agricultural land. Moreover consumers were not concerned about the harmful effects of inorganic produce.

***Key words: organic agriculture, food security, livelihood, Baglung, role***

