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# HICAST RESEARCH ABSTRACTS



Himalayan College of Agricultural Sciences and Technology  
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**HICAST  
RESEARCH ABSTRACTS**

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## ***Foreword***

*Himalayan College of Agricultural Sciences and Technology (HICAST) has been conducting bachelors and master degree programs in affiliation with Purbanchal University from September 2000. The bachelors degree programs include 4-year BSc (Honours) Agriculture and 5-year BVSc and AH, while the 2-year master degree programs include MSc Dairy Technology and MSc Meat Technology. Both the bachelor and master degree students must conduct field- and lab-based research, write and submit thesis based on that research for obtaining the degree the student is enrolled for. On an average 70 such researches are conducted each year. Without being properly and timely published, these research findings cannot reach to wider readership and continue to remain as decorative materials in the book shelves of the library. Realizing the importance of widely circulating at least the abstracts of those researches an attempt has been recently made to properly edit, compile and publish the Thesis research abstracts annually.*

*This publication is thus a collection of abstracts of the thesis researches conducted during the last five years i.e. 2004 to 2008. This is the first publication of the college of its kind; although some abstracts have had been published in the scientific journal of HICAST- Green Field or Nepalese Journal of Agricultural Sciences. Relevant thesis can be consulted at the library of HICAST. A list of thesis researches conducted during that period is also included in this publication, as some theses lacking abstracts are not covered by this publication. Such abstracts will be incorporated in the forthcoming issue(s) of the HICAST Research Abstracts, provided the concerned graduate send those for publication.*

*This publication has been divided into 6 chapters viz. 1 Dairy technology; 2 Meat technology; 3 Crop and soil science, 4 Plant protection, 5 Agri-economics and agri-business management; and 6 Veterinary science. This division is based on the departments they fall within. In future, there might be some changes depending on the subjects covered by the thesis researches.*

*It is hoped that the publication will be useful for the students, researcher, teachers, policy makers and development workers/institutions. This is the publication that each student of HICAST should possess.*

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## 1 Dairy Technology

### Process optimization for the preparation of indigenous dairy product *Pustakari*

**Keshab Achhami**

A study on process optimization for the preparation of indigenous dairy product – *pustakari* - was carried out in Kathmandu valley from September, 2006 to February, 2007. Survey of *pustakari* was carried out in the municipalities of Kathmandu valley. The data obtained from survey showed that the daily sale of *pustakari* was about 978 kg with the average price of Rs. 152 per kg, and annual sale was about 357 metric tons costing approximately Rs. 54 millions. For optimization of *pustakari* manufacturing process, three levels of *khoa*, sugar and *maida* were selected to the basis of survey report. Three types of *pustakari* were experimentally prepared by using three different levels of ingredients. Then three experimentally prepared and one control *pustakari* (available in market) was evaluated. The optimum level of these ingredients ratio was selected on the basis of sensory evaluation. The *pustakari* with *khoa*, sugar and *maida* in the ratio of 45:45:10 was of the most acceptable quality. The energy content in process optimized *pustakari* is higher (422 kcal/100g) than control product (408 kcal/100g). The optimized product of *pustakari* was vacuum packed in low density polythene (LDPE 75 micron) and stored at refrigeration (4-6°C) and room temperature (18 – 22°C) for studying the storage stability based on chemical, microbiological and sensory changes on 0, 7, 14, 21 and 28 days of storage. The chemical compositions of the process optimized and control product were found significantly different ( $p < 0.05$ ). Similarly, pH value of *pustakari* showed significant difference ( $p < 0.05$ ) after 14 days onwards. Microbiological aspect as TPC was found significant in both products where as coliform; yeast and mold were not detected. The results showed that the changes in product packing stored under both conditions were not found to be much different and no effect on quality up to 28 days of storage was observed.

### A study on coliform count in various milk flow levels and sources of post pasteurization contamination

**Rajendra Prasad Adhikary**

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High microbial load associated with coliform bacteria in milk lower their keeping quality and might be the source of potential risk for milk epidemics. For much of the twentieth century, coliform bacteria have been used as indicators of possible post-processing contamination in milk. Coliform count of four different dairy plants (A, B, C and D) and in different processing levels viz., raw milk before heat treatment, just after pasteurization, storage tank, overhead tank and packaged milk was investigated during

October 2006 to March 2007. Results indicated that the coliform count of raw milk of all dairies was high with average of 5.84 log<sub>10</sub>, 6.95 log<sub>10</sub>, 6.50 log<sub>10</sub>, and 6.41 log<sub>10</sub> cfu per ml in dairy A, B, C, and D respectively. The same milk in just after pasteurization showed nil coliform in three dairies and very few coliform in dairy D. In further processing steps viz. pasteurized milk storage tank and overhead tank, the number increased in some dairies and in final packaged milk reached 1.75 log<sub>10</sub>, 1.00 log<sub>10</sub>, 1.42 log<sub>10</sub> and 2.07 log<sub>10</sub> cfu per ml in A, B, C and D dairy, respectively. The possible sources of post pasteurization contamination like air, water, storage tanks and packaging plastic film were also investigated. The results showed that all these factors contributed high level of contamination to the processed milk except in dairy B. Hence, heat treatment during pasteurization in investigated dairies was satisfactory, while post processing contamination was the sources of coliform in processed milk.

### **Quality evaluation of *Juju dhau***

**Jeeva Lal Lamsal**

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The present study was conducted to analyze the quality of indigenous set type yoghurt known as *Juju dhau*, manufactured in Bhaktapur municipality areas of Bhaktapur district of Nepal. The quality of *Juju dhau* was compared with yoghurts produced by large to small scale industries in term of physical, chemical, microbiological, and organoleptic attributes. In this research, a total of 111 yoghurt samples were analyzed during the period of January to April 2007. Genstat (3.4.2) for windows statistical package program was used for statistical analysis. Completely randomized design (CRD) was fixed and DMRT ( $p < 0.05$ ) was used to determine difference between the treatment means. Analysis of variance (ANOVA) was performed for the conclusion of consumer preferences of yoghurts. Yoghurt samples examined showed a considerable degree of variation in total solids, fat, and syneresis. A non significant difference in overall acceptability, i.e. 3.42, 3.52, 3.57 among samples of *Juju dhau*, large scale and medium scale dairy respectively were observed and significant difference between small scale dairy (2.88) and the rest of the samples were observed in overall acceptability from sensory evaluation. Significant difference in fat percent, total solid and syneresis among the samples of small scale dairy i.e. (2.72%, 17.00% and 46.85%) and the rest of the dairy samples were observed. Non significant differences in protein, acidity and pH were observed among the samples of *Juju dhau*, large scale, medium scale and small scale dairy. Among 10 samples of *Juju dhau* analyzed for coliform, four samples had contamination with coliforms showing lack of maintenance of sanitation and hygienic conditions. The medium scale dairy sample scored highest with highest overall acceptability (3.57) exhibiting the best sensory properties with a rich smooth taste, mild creamy color and desirable compactness. The yoghurt produced by large scale dairy scored second position (3.53) and *Juju dhau* under study scored third position (3.42). The yoghurt produced by small scale dairy scored lowest position (2.88) in term of consumer acceptability. The present study has thus

established documentation of an important indigenous dairy product and has created a platform for further research.

### **Process optimization for the preparation of Khoa based indigenous product *Gundpak***

**Narayan Prasad Sharma**  
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A survey study on Kathmandu valley was carried out to know the present market status and socio-economic importance of *Gundpak* and a study on process optimization for the preparation of the product was undertaken at Himalayan College of Agricultural Sciences and Technology, Bhaktapur during the period from July to December 2006. Four levels of *Khoa* and sugar (50:50, 60:40, 70:30 and 80:20) were selected on the basis of sensory characteristics and textural properties. The *Gundpak* having 60:40 *Khoa*: sugar ratio resulted in a highly acceptable quality product with significant ( $p < 0.05$ ) improvement in sensory scores. The results of proximate analysis gave the significantly ( $p < 0.05$ ) high energy content (440 Kcal/100 g) in process optimized product of *Gundpak* in comparison to the control product (428 Kcal/100g). The standardized product of *Gundpak* was vacuum packed in low density polyethylene (LDPE) and stored at refrigeration (4 - 6°C) and room temperature (18 - 22°C) for studying the storage stability based on the chemical changes in term of pH, microbiological changes in term of total plate, yeast/mold and coliform count and sensory changes in term of flavor, color and body and texture on 0, 7, 14, 21 and 28 days of storage. The result showed faster deteriorative trends in the product stored on room temperature in comparison to that stored under refrigeration. The vacuum packed standardized product in LDPE was stored successfully upto 14 days under room temperature and upto 28 days under refrigeration without any defect. The effect of storage temperature, storage period and interaction of them on storage stability of *Gundpak* was found highly significant ( $p < 0.01$ ).

### **Study on physico-chemical constants of *ghee* produced from cow, buffalo and mixed sources**

**Devendra Bhagat**

Samples of *Ghee* (cow, buffalo and mix) were collected from 3 eco-zones during the period of July to December 2006. Within the three eco-zones following were the nine districts from which the samples were collected: Taplejung, Sankhuwasava and Solukhumbu from high hill, Kathmandu, Kavrepalanchowk and Gorkha from mid hill and Rupandehi, Nawalparasi and Chitwan from flat land. All the *ghee* samples were kept under refrigeration condition till evaluation. All the parameters of *ghee* samples were evaluated separately. These samples were used to access the quality of *ghee* through physical and chemical analysis. The analyzed physical parameters were moisture content,

refractive index and the chemical parameters were RM value, acid value and peroxide value. The RM values were found to be in the range 24.84 - 29.42 and there was non significant difference within eco zones among species and within species among eco-zones. The acid values were found to be in the range of 1.11-2.1 and there was non significant difference within eco zones among species and within species among eco-zones. The peroxide values were found to be in the range of 3.86-7.25 and there was non significant difference within eco zones among species and within species among eco-zones. The refractive indexes were found to be in the range of 1.4554 - 1.4563 bands. There was non significant difference within eco zones among species and within species among eco-zones. The moisture content was found to be in the range of 0.22 - 0.55 band there was non significant difference within eco zones among species and within species among eco-zones. Only the sample of buffalo *ghee* from high hill meeting the Nepal Standard for RM value and rest samples are substandard. The lower RM values of *ghee* were may be due to the feed, breed, lactation, season; management could improve the level of RM value of *ghee*.

### **Study on qualitative evaluation of raw milk produced in Lalitpur district**

**Dipendra Chaudhary**

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Study on qualitative evaluation of raw milk produced in Lalitpur district was conducted from December 2007 to May 2008. The raw milk samples were collected from farmer's level, collection level, chilling center level and dairy factory gate and brought to HICAST Dairy Technology Laboratory in icebox. Chemical and microbiological analyses of raw milk at different levels were done to assess the quality. The chemical parameters included fat%, SNF%, acidity%, starch, salt, sugar, sodium bicarbonate, formaldehyde content, and the microbiological parameters analyzed were Total Plate Count (TPC) and coliform. The fat% of raw milk varied from 5.59 to 5.90 and showed no significant difference between and within milk collection levels. The SNF% of raw milk varied from 8.45 to 8.54 and showed no significant difference between and within the milk collection levels. The acidity % of a raw milk varied from 0.15 to 0.17 and there was significant difference between and within the milk collection levels ( $p < 0.05$ ). The uses of starch, salt and sugar varied from 10 – 20, 10 – 15 and 5 – 15 from farmer's level to factory level, respectively. The use percentage of sodium bicarbonate and formaldehyde varied from 75 – 80 and 10 – 20 from farmer's level to factory level, respectively. Milk neutralized by the sodium bicarbonate was found maximum in all the levels of milk collection so it required chilling facility and evening milk collection at all the levels to improve the raw milk quality. The TPC varied from 7.49 – 8.08  $\log_{10}$  cfu/ml. the TPC of raw milk at the different level of milk collection was found significantly different ( $p < 0.05$ ). Similarly the coliform load of raw milk varied from 7.06 to 7.53  $\log_{10}$  cfu/ml and showed significant difference ( $p < 0.05$ ). The raw milk quality was found poor in term of microbiological aspect from farmer's level to factory level and needed to be improved.



## Preparation and quality evaluation of probiotic yoghurt

**Choodamani Bhandari**  
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A study was carried out to evaluate the quality of laboratory prepared different types of probiotic yoghurt and compare its quality with market yoghurt and *juju dhau*. Parameters used to monitor the quality of *dahi* samples were chemical (acidity %, pH, protein %, TS % and syneresis) and microbial tests (coliform count, yeast and moulds and *Lactobacillus acidophilus* and *Lactobacillus casei*). The physico-chemical parameters showed that there was significant variation in acidity, pH, protein, TS and syneresis in market yoghurt, *juju dhau* and probiotic yoghurt ( $p < 0.05$ ). Similarly, the average yeasts and moulds content in the market yoghurt, *juju dhau* and probiotic yoghurt were observed 1.80, 4.46 and 0.00, respectively. These results also showed significant variation ( $p < 0.05$ ). The mean values of probiotic organism present in the probiotic yoghurt at the day of production and after storing the product for 7 days at 4°C was found to be 10.30 and 9.80, which showed no significant variation in probiotic organism content ( $p < 0.05$ ). The paired t-test of all six different probiotic yoghurt also supported the result by showing no significant variation at production day and after storing the product for 7 days at 4°C ( $p < 0.05$ ). It was interesting to note that there were probiotic organisms in *juju dhau*. The mean values of probiotic organism in the *juju dhau* were 0.82.

## Study of dairy effluents in manufacturing industries

**Sushil Adhikari**  
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The purpose of the study was to determine the pollution parameters of dairy effluent produced by Kathmandu Milk Supply Scheme (KMSS) and local dairy industry of Kathmandu valley as well as to compare the degree of pollution generated while manufacturing the main product. The total number of samples was 15, out of which 12 from KMSS and three from local dairy industry. The samples were taken from the main drainage of dairy industry, cleaning in place (CIP) of standard fluid milk section, paneer whey, butter washing and buttermilk. These effluent samples were examined for the parameters like pH, ammonia, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids (TDS), total solids (TS) and chloride content. The analysis of variance was also studied to see the significant difference among the quality parameters ( $p < 0.05$ ). From the study it was observed that the mean pH ranged from 5.47 to 10.79, while that of ammonia content was found to be between 4.86 to 43.55 mg/l. The BOD level observed in buttermilk was maximum (80,000 mg/l) as compared to other effluents. Likewise the COD level observed in buttermilk was highest which was 112,000 mg/l whereas the lowest for butterwashing. From the study it was observed that buttermilk showed maximum TSS value of 79,970 mg/l whereas CIP showed minimum value of 252 mg/l. TDS level was observed

maximum for buttermilk and the least in butterwashing which was 14,924.33 mg/l and 365.66 mg/l, respectively. Total solids present was found to be higher in buttermilk and least in butterwashing, which were 94,860.67 mg/l and 730.66 mg/l, respectively. The sampling spots of paneer whey showed the highest chloride value of 0.82 mg/l and CIP and butterwashing showed the lowest chloride value of 0.02 mg/l. The relation of various sources in contributing the degree of pollution was studied which showed that BOD, COD and TS are highly correlated. The correlation between  $\text{NH}_3$ , BOD and COD was moderate which was significant at 0.05 levels.

## 2 Meat Technology

### Shelf – life study of buffalo meat sausage under refrigeration

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The study was carried out during July to December 2006 at Himalayan College of Agricultural Sciences and Technology, Bhaktapur. For the purpose of study, required amount of deboned buffalo meat and fat were purchased from the retailer to prepare emulsion-type of sausage adopting the recommended standard procedure and hygienic measures. However, the process of smoking was not adopted but was steam cooked up to internal temperature of 70 – 72°C and was stored under refrigeration ( $4 \pm 2^{\circ}\text{C}$ ). The results of various quality parameters with respect to different period of storage (0, 3, 7 and 14 days) were carried out including proximate analysis, physico-chemical, microbial qualities and sensory evaluation for self made and the marketed buffalo meat. The ANOVA of overall treatment mean  $\pm$  SE values for the TVC, ERV and pH showed highly significant ( $p < 0.01$ ) difference between the self made sausage and marketed sausage. However, the values of TVC and yeast and mold count were found increasing for both sausages with the increasing storage period. The TVC value was found exceeding towards spoilage at the 7<sup>th</sup> day of storage. Similarly, the correlation study between physico-chemical characteristics and the microbial activity revealed high positive ( $p < 0.01$ ) value of ERV that correlated with ether extract but negatively correlated ( $p < 0.05$ ) with crude protein. Similarly, moisture content indicated high positive correlation with ether extract and ERV. However, pH showed the highly ( $p < 0.01$ ) negative correlation with ERV and moisture content and significantly negative correlation with ether extract. There was positive correlation with ERV but negative ( $p < 0.01$ ) with crude protein and pH. It also showed the significant positive correlation with moisture content of the product. Similarly, TVC showed the negative high significant correlation with total ash. While for the pH, it showed highly significant correlation but significantly positive correlation with protein. Yeast and mold count showed a highly negative correlation with ERV, moisture and total ash and significant correlation with fat. There were highly significant positive correlations with TVC and pH and also positively significant with protein. Based on these findings, the present study suggests that the buffalo sausage can be safely stored at  $4 \pm 2^{\circ}\text{C}$  for seven days.

## Process optimization and quality evaluation of chicken dried meat “Sukuti”

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A study on process optimization and quality evaluation of chicken dried meat - “sukuti”- was carried out covering a period of July – December 2006 in Himalayan College of Agricultural Sciences and Technology, Bhaktapur. Lean leg piece and breast muscle having the least subcutaneous fat were collected aseptically by dressing the broiler. The meat portions were skinned, deboned, trimmed, and hard frozen in deep freezer for 8 hrs. Meat slices of 5mm uniform thickness of about 5g were cut and seasoned in four different recipes and kept at  $4 \pm 1^{\circ}\text{C}$  for 24 hrs. It was then cooked up to  $69 - 71^{\circ}\text{C}$  of internal temperature and dried at  $100^{\circ}\text{C}$ . Sensory evaluation was carried out to select the recipe for further optimization. The same processes were applied to prepare the ready to eat chicken *sukuti* and dried at 80, 100, and  $120^{\circ}\text{C}$  for 4, 3 and 2 hrs respectively. All the dried meat was sampled into two different vacuum packaged aluminum laminated and high density polyethylene (100 gauge plastic). The samples were examined at 0, 30, 60 and 90 days for physico-chemical, microbiological and sensory evaluations. The recipe was selected on the basis of significance in flavor score. ERV and pH differed significantly ( $p < 0.01$ ) with storage periods, temperatures and packaging materials. Proximate analysis of dried meat showed highly significant ( $p < 0.01$ ) difference among storage periods, temperatures and packaging materials. Highly significant ( $p < 0.01$ ) difference was also observed between packaging materials, temperatures and storage periods in the case of TVC and yeast and mould counts which were within acceptable level ( $< 10^4$  cfu/g) showing no spoilage. The sensory indices showed the highly significant ( $p < 0.01$ ) difference with storage period only. The correlation of pH, TVC and yeast and mould counts revealed a highly significant ( $p < 0.01$ ) negative correlation with ERV but were highly significant ( $p < 0.01$ ) positive correlation with moisture. Protein was positively significant ( $p < 0.05$ ) with moisture, ash, yeast and mould counts. Ether extract showed significant ( $p < 0.05$ ) negative correlation with pH, ash and protein. The chicken dried meat did not show any sign of spoilage up to 90 days of storage at room temperature ( $25 \pm 3^{\circ}\text{C}$ ) qualitatively. The study also revealed  $100^{\circ}\text{C}$  drying temperature and aluminum laminate package to be the most acceptable from all respects.

## **Study on physico-chemical and microbiological quality of buffalo meat at retail outlets of Kathmandu valley**

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A study on physico-chemical and microbiological quality of buff meat under condition those prevail in open retail meat markets of Kathmandu valley and most probably in other developing countries where buff meat is marketed was carried out during July to December 2006 at Himalayan College of Agricultural Sciences and Technology Bhaktapur to assess the hygienic status of retail outlets. Total forty fresh buff meat samples of one kg in combination of muscles as biceps femoris, semitendinosus, quadriceps, femoris, gastrocnemius and braichial had been collected aseptically from improved and traditional buff meat retail outlets in summer (July) and winter (December) season at 7 A.M. morning and were examined immediately and after ten- hours storage (in conditions similar to both the type of retail outlets) for physico-chemical and microbiological quality. The storage temperature, pH, ERV and WHC were parameters for physicochemical quality where as TVC, coliform count and *S. aureus* count come under microbiological quality. The result of the study clearly indicate no significant difference ( $p>0.05$ ) in retail outlet by type in pH at morning but there was a significant difference ( $p<0.01$ ) in two seasons and time. The storage temp and WHC were found high with low ERV with significant difference ( $p<0.01$ ) in retail outlet type, season and time. In the study, higher variation in these parameters indicated higher potential for buff meat spoilage and losses however the improvement in retail outlet facility and control over the temperature and storage time can control the quality losses and changes. The hygienic quality revealed that there was significant difference ( $p<.01$ ) in retail outlet by type, season and time. The count for microbes was critically high however in acceptable limit except in summer evening at traditional retail outlet which was one log above the acceptable limit. The study reflected improvement in facility at retail outlet could lower the contamination, fostering the correct attitude of personnel hygiene and thus inhibition of microbial growth that deteriorate the quality due to control over the environment. Among isolated organism the predominant organism as coliform had highest frequency followed by *S. aureus* and *Salmonella* species.

### 3 Crop and Soil Science

#### **Bio-intensive farming system: indigenous knowledge system and participatory agro-biodiversity conservation for sustainable livelihood**

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The study was conducted during March to June 2004 in Rauta and Hadiya VDCs and Triyuga Municipality of Udayapur district in cooperation with Women's Rehabilitation Center (WOREC) to analyze the contribution of BIFS in indigenous knowledge and participatory agro-biodiversity conservation for sustaining the livelihood of farming community. Findings of this study are based on the perception; knowledge and experience of randomly selected 50 households directly engaged in implementing BIFS. People's indigenous knowledge and traditional practices in relation to soil fertility and moisture management, seed quality and pest management and seed storage practices were found crucial to maintain ecological sustainability and food security. Farmers have conserved more than 32 species of agronomical and 50 species of fruits and vegetable crops. Similarly, 7 species of livestock and over 31 species of non-timber forest plants were being conserved and used by people. It has revealed encouraging results about participatory conservation and utilization of agro-biodiversity, creation of awareness among the farming communities, and various livelihood strategies. Growing of high value vegetable crops and rice landraces; adoption of crop rotations, mixed farming, mixed and intercropping, marketing of surplus, involvement in service works and learning of new technologies/ideas by organizing farmers' group meeting (monthly) are some of the important coping strategies being practiced by the local farming community; and these strategies were strongly supporting to achieve their adoptive strategy, the sustainable livelihood.

#### **Traditional hill farming system and food security: constraints and alternatives**

**Bandana Aryal**

An exploratory study entitle "Traditional hill farming systems and food security: constraints and alternatives" has conducted at Majhipheda VDC - 2 and 3, the remote hilly areas of Kavrepalanchowk district, Nepal, to study the issues of food security imparted by traditional hill farming systems and constraints and alternatives of hill farming systems. A total of 246 households were selected randomly to collect information through interview method. From the study it could be revealed that majority

of farm families are following traditional farming practices due to unavailability of external agro-inputs and the lack of skills related to the improved agro-technology. The agriculture in the study area is characterized by integrated crop-livestock production system. A majority of them have been growing cereals, potatoes and other seasonal vegetables with livestock. It is also found that some of the indigenous knowledge and sustainable farm practices have disappeared from the place of origin. Farmers share the knowledge and skills related to farm practices regardless of their socio-cultural and economic background albeit some religious taboos and traditions of the farmers influence the proper choice of crop varieties and animal husbandry practices. The dismal proposition of the study area is that food production is far from household requirements and they are looking for the alternatives to suffice the food requirements. As per the respondents, it is the lack of irrigation by which food production lags behind the requirements. Potent constraints of farming systems in the study area are inaccessibility of external inputs, scientific know how, extension services etc. It can be highlighted that food security can be ensured in the study area if timely irrigation facility would be made available, proper and timely delivery of extension services, scrutinizing appropriate technology apt for the area.

### **Impact assessment of information system in vegetable production: a comparative study between bio-intensive farming system and subsistence farming system**

**Ammar Bahadur Bhandari**

The field-based research was carried out in WOREC's targeted V.D.Cs. in Udayapur district to compare the achievements and weakness of bio-intensive farming system (BIFS) and subsistence farming system (SFS). The study was conducted during 15 May to 15 August 2006 to know the role of information in vegetable production with special references to existing channels of information in vegetable production in BIFS and SFS, production technology and marketing, consumption behavior and nutritional status, and strengths and weaknesses of information flow system being practiced by local farmers. A total of 120 sample each 60 from BIFS and SFS adopting farmers were selected purposively. Semi-structured questionnaire followed by interview and focus group discussion (FGD) were the techniques of data collection. It was found that 83.3% of BIFS adopting farmers were satisfied with existing channel of information whilst, 73.3% of SFS farmers were unsatisfied. Major source of information was FFS and MDF (46.7%) in BIFS and indigenous knowledge in SFS (70%) adopting farmers. The incorporation of vegetables in cropping pattern was found increased drastically in BIFS but it was negligible in SFS adopting farmers. Out of total 56.7% of BIFS farmers were saving their own vegetable for next year use while 63.3% of SFS were dependent upon nearby agro-vets. It shows that BIFS farmers were more aware about agro-biodiversity conservation. The finding of the study shows that fertility status and water holding capacity of soil during five year period was found increased while compactness and clods was found

decreasing in BIFS on the contrary the fertility status and water holding capacity of soil was decreased and compactness as well as clods was found increased in SFS adopting farmers. The trend of pesticide using was found decreasing and the vegetable consumption pattern was found increasing in BIFS (76.66) while the trend of pesticide using was found increasing and vegetable consumption pattern was found decreasing in SFS (53.3%). The leafy vegetable consumption was found higher than FAO recommendation in BIFS 145.94g instead of 125g but it was only 73.13g in SFS far below than recommended SFS. Those all changes and awareness were found due to proper information mechanism developed by WOREC for BIFS adopting farmers whilst, no measurable changes were found in SFS adopting farmers due lack of information mechanism. Important finding of the FGD was that either WOREC or government should implement BIFS in the entire locality for sustainable development of agriculture sector and to increase vegetable production in household level. The increasing trend of agro-chemicals in SFS also affect on soil ecology, human health, as well as environment. Thus it could be highlighted that there should be proper information mechanism up to farmers' level as that of BIFS and all the farmers need to be addressed under the same umbrella of BIFS information system to make them aware and to provide them practical knowledge to increase vegetable production as well as to save the ecology.

### **Bio-intensive farming system: role of intensive organic vegetable production for sustainable livelihoods**

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This study was conducted to analyze the contribution of intensive organic vegetable production for sustainable livelihoods within the framework of bio-intensive farming system (BIFS) approach. Based on the perception, knowledge and experience of 50 households directly engaged in implementing BIFS in hill, lower hills, and terai ecosystems in Udayapur district. Farmers of study site were found making progress both from the nutritional and economic point of view. The farmers have been practicing intercropping and mixed cropping with scientific crop rotation for higher production per unit area per year. Aphids and beetles were the major insect-pests prevalent in the study area, while powdery mildew and blight were the major diseases. Most of BIFS adopting farmers are using organic (botanical) pesticides like tobacco leaf, *neem*, *titepati*, *sisnoo*, marigold, *bojho*, etc. Most of these farmers used botanical pesticide and other material randomly to get rid of different diseases and pests of vegetables. They were formulating botanical pesticides themselves. Most of the farmers reported that the level of efficiency of botanical pesticide was 40 - 60 percent. The sources of seed are agro vet, WOREC, DADO, saving the seed themselves and exchange each other. Canal, *paini (kulo)*, tube well are the important source of irrigation. WOREC has been providing most of training and workshop, which helps to build the capacity of BIFS adopting farmers. Most of the respondents (86%) use organic vegetables for home consumption as well as for selling. They generally sell vegetables in the local market. Production as well as income level is



increasing among BIFS adopting farmers; and their livelihoods and nutritional security has been improving. This is the most important impact of organic vegetable production among the BIFS adopting farmers in the study sites.

### **Assessment of growth responses of tree species in experimental bio-energy plantation**

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Agricultural practices are becoming costly due to the expensive manual labor work. Because of this reason agricultural lands are abandoned mainly in developed countries and forestry and agro-forestry practices have been started. In developed countries, there is a growing trend towards employing modern technologies and efficient bio-energy conversion. Finland is one of the European countries showing an increased interest in renewable energy sources. In this regards, experimental study for the short-rotation (SR) plantations was one of the options to be studied. Salix diameters were recorded in the distance of 50 cm of the cleared radius. Height and diameters were measured in the month of July, August and September. Biomasses were also calculated for salix using models. In addition to this, laboratory research was carried out for the harvesting operation by harvesting tractor in the salix field. The result shows that height increment over the period was distinctive. For birches 15.92 cm was the average increment in height. The average height change of the birches over the period was estimated as 18.57% for August and 7.73% for September whereas the minimum and maximum height change varied between 1.39% and 49.68%, respectively for August and 1.03 cm and 20.3 cm for September. For alders the average increment was 33 cm and the minimum and the maximum increment percentage were 10.3 cm and 55.5 cm, respectively. Pearson's correlation showed that there is no correlation between the weeding spacing and growth of sample plants. Result showed the total dry weight biomass for Salix stumps is 48.15 kg in measured plant and that was equivalent to 34.40 ton per ha. Similarly birch biomass was 0.14 ton per ha. Estimation of linear regression for salix and birch biomass corresponding to the diameters showed that there was no model fits to the Salix  $R^2=0.215$  and for Birch  $R^2=0.942$ . Time study showed that the machines were not efficient work during the harvesting. This study concludes that the experimental plots produces significant amount of dry biomass of salix and the different spacing of weeding does not have effect on height growth. Boletus collection and marketing is exemplary for Nepal and it must be learnt by the academia for the enhancement of study.

## **Non timber forest product conservation and contribution to rural livelihood (a case study in Dhanusha district)**

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The study aimed not only to document existing NTFPs but also to explore their potentiality for livelihood. Similarly, the study attempted to assess the benefits to local people and people's participation in NTFP management. The result showed that there were altogether 59 NTFPs in the study area. The local people have been using NTFPs mostly for income generation. In Puspapur, *Dhanusha kurilo* (*Asparagus racemosus*) was mostly used, while in Bengadawar, *Dhanusha* bamboo (*Dendrocalamus spp.*) and in Yagyabhumi, *Dhanusha bhorla* (*Buhinia vahli*) were used for income generation and livelihood. The people's participation in NTFP management seemed good; women had actively participated in NTFP management. NTFPs are contributing to livelihoods of rural people through creating opportunities of income generation and employment directly or indirectly. Local people have been earning Rs.1,800 to Rs.7,200 annually from NTFPs in Puspapur. Local people of Bengadawar have been earning Rs.15000 to above Rs. 60,000 annually. In Yagyabhumi, households engaged in NTFPs were found selling the product of *bhorla* and they were earning Rs.12,000 to Rs.28,000 per year. It was found that NTFP has contributed a lot in the financial capital to the study area. Majority of the targeted groups collected NTFPs mainly for income generation. Only few people used NTFPs for household consumptions and as a medicine. Government support was not evident in the study area. Bengadawar and Yagyabhumi were lacking any kind of support from NGOs. They had not received any training related to NTFPs except very few in Bengadawar. It was found that they had no idea about the policy of NTFPs. Most of the species were in sparse condition. They did not have any knowledge about NTFPs and its conservation. Based on the findings of the study, it has been suggested that the users should be made aware of the forest resources for better income generation activities; and the NTFPs management plan should be incorporated in the operational plan of VDC. There should be the protection and management of commercially important species. Moreover, NTFPs being variously used by different ethnic groups, different types of NTFPs should get due consideration in developing future strategy. It was found that BISEP-ST and Plant Resource Office had organized training about cultivation of NTFP and its marketing in Puspapur VDC. They had also provided support to that VDC like distribution of seedling of *kurilo*, sprayers and fertilizers. But no specific policies with regard to NTFPs are implemented in the study area.

## **Impact of bio-intensive farming system on food security in Udayapur district**

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The study was conducted during May to August 2007 in Udayapur, one of the food deficit districts. This district was purposively selected for the study since BIFS has been implemented in this district by WOREC for the last eight years. Udayapur has both hills and terai areas. The study was done in 5 VDCs namely Saune, Khabau, Hadiya, Beltar, Jogidaha and one municipality of the Udayapur district i.e. Triyuga Municipality. The methodology used in this study included semi-structured questionnaire survey, focus group discussion, field visit and observation. The population of the study was found to be ethnically diverse where Brahmin dominated the total population followed by Magar, Rai, Tharu, B.K., Damai and Chhetri. The number of the women respondents was greater than male respondents in both type of farming systems. The number of illiterate members per household was double in conventional farming system adopting farmers (CFSAF) than in bio-intensive farming system adopting farmers (BIFSAP). The BIFSAP had higher land holding size of 1.1 to >2 hectares than CFSAF (0.5-1 hectare). The irrigation facility in BIFSAP (68%) was higher than in CFSAF (56%) this was because the irrigation facility was basically supported by WOREC to the BIFSAP. The BIFSAP and CFSAF have been practicing mixed farming system (MFS) as the farmers adopting BIFS were more aware about the advantages of MFS than farmers adopting CFS. Ninety percent of the respondents adopting BIFS applied OM and only 40 percent of the respondents adopting CFS used OM as a source of nutrition in their fields which shows that quite a big percentage of the farmers had converted their conventional farming system into sustainable organic farming system. The study revealed that BIFSAP has been increasing the amount of OM in their field. Eighty percent of the BIFS were formulating botanical pesticides to manage the pest and diseases problem of their crops. This shows that BIFSAPs were more conscious about the health hazardous effect of chemical pesticides. The farmers adopting BIFS were found to be investing more on vegetables than CFSAP. This was because they were taking vegetables as the source of income generation. The household income from vegetable production was found to be higher in BIFSAP because they used to sell the vegetables while CFSAP rarely used to sell their vegetables. The consumption of the cereal and vegetables in proper proportion was found among the farmers adopting BIFS than CFS. This shows that BIFSAP were aware about the importance of vegetables for their nutrition. The shift in vegetables consumption pattern was in higher among the farmers adopting BIFS than CFS which was due to their participation in various training and workshops organized by WOREC. Majority of the farmers adopting BIFS used to consume meat weekly whereas 60 percent of the farmers adopting CFS used to consume meat at monthly interval. This was because the farmers adopting CFS did not have the capacity of purchasing the meat frequently. Farmers adopting both BIFS and CFS consumed eggs only in negligible amount. The food secured households adopting BIFS were found to be 36 percent while the figure was

28 percent for CFSAF households. Twenty percent of the households practicing the BIFS were found to be mildly food insecure while this was found to be only 16 percent in CFSAF. Sixteen percent of the BIFSAF and 12 percent of the CFSAF were found to be moderately food insecure while 22 percent of the BIFSAF and 44 percent of the CFSAF were severely food insecure. This was because they did not have fertile land, irrigation facility and other inputs required to increase their production and productivity.

### **Impact assessment of organic vegetable production on food security in Udayapur**

**Lakshya Bahadur Chaudhary**

A field-based study was conducted during September to November 2008 in Saune, Khanbu, Rauta, Jalpa, Jogidaha, Hadiya VDCs and Triyuga municipality of Udayapur district to assess the impact of organic vegetable production (OVP) on food security. Field level purposive and simple random sample survey in 50 households was conducted in the study area. The households' survey revealed that organic vegetable production was increasing in Udaypur district where WOREC Nepal has been implementing bio-intensive farming system (BIFS) program for the last eight years.. The food secure households producing organic vegetable under BIFS was found to be 48% while 8% of the HHs were mildly food insecure. Similarly the moderately and severely food insecure HHs were found 24% and 10%, respectively. This was because they did not have fertile land, irrigation facility and other inputs required to increase their production and productivity. The impact of OVP on food security was significant because it contributed 70% of the total crop production, and the farmers had more access to the organic vegetables as compared to the cereal crops. The produced vegetables were utilized to fulfill basic needs and as source of income generation also.

### **Plastic house technology adopted by farmers for tomato production in Hyangja, Kaski**

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A study was conducted to assess the impact of plastic house technology adopted by farmers at Hyangja VDC in Kaski district. Farmers grew tomatoes in rainy season under plastic house. Farmers produced different types of vegetables in their farms with higher income obtained from tomatoes produced in plastic houses. The people of VDC were engaged in agriculture (92.1%) but female farmers were involved lesser as compared to the male farmers. The cultivation of tomato in the plastic house was inspired by neighbor and increased this technology year after year. The average sizes of the plastic houses ranged from, 6.19m to 16.25m. Most of the farmers preferred Silpolythene for construction of plastic house with half cover system. The income from tomato plants

grown under the plastic houses was as high as NRs. 200,000.00. Cost benefit analysis for tomato production in plastic house indicated higher income of NRs. 212,887.50 as compared to the open field condition (NRs. 40,650.00). However, there were number of problems to be tackled efficiently; and the major problem was associated with the proper management of tomatoes grown under the plastic house system.

### **Perception and practices of organic farming among the commercial vegetable farmers of Mahadevbeshi, Dhading**

**Rashmi Joshi**

Organic farming is receiving increasing attention in Nepal and in the world at present. To understand its status of perception and practices among the commercial vegetable growers of Nepal, a study was carried out among the 50 households in Mahadevbeshi village of Dhading district. The study revealed that neither the farmers have sufficient knowledge on organic production nor they have any heart touching feelings regarding the long or short term effect of chemical pesticides. Even with the farmers who have a bit of knowledge about it they seldom adopt any precautions against the ill effects of these chemicals. Among the farmers interviewed, none of them were totally organic farmers and even all of them used nitrogenous fertilizers in maximum. Though they knew that the organic fertilizers and pesticides are good for the plants they gave preference for chemicals as they do believe that at the end they will need them to protect their crops. Lower productivity of organic production as compared to inorganic production, lack of price incentive scheme of organic produce, lack of regulatory mechanisms to trace out the pesticide residue in vegetable crops had compelled farmers to go more towards chemicals.

### **Commercial vegetable production in leasehold land for nutritional security of marginalized community in Morang district**

**Ashima Poudel**

Production of vegetable in Nepal is very important in order to reduce the total vegetable import every year and to increase the income of farmers and promote cheap and easy availability of nutritional requirement of the people. Commercial vegetable production in leasehold land is newly adopted practice by some farmers in Nepal. With the objective of mobilizing marginalized/landless farmers towards commercial vegetable production, many developmental organizations are putting their effort towards leasehold land-based cultivation. This practice can help not only to uplift the economic condition of the farmers' family but also promote the nutritional status of the growers and nearby community. This study was conducted in Morang district with the objective of assessing the impact of commercial vegetable production in leasehold land towards nutritional security of marginalized people of Morang district, Nepal. A semi-structured

questionnaire survey was carried out to collect relevant information from 50 households that were selected randomly from seven different VDCs. The data were analyzed using Microsoft excel software. This study showed that after about eight years of the inception of this program, tremendous changes with respect to nutritional security, income level, education status and social awareness have been observed among the marginalized/landless family. Child and mother health status has been improved due to availability of various fresh vegetable round the year. The income level per family has been increased by up to four fold. Though some households cast off from this program after couple of years of practice, majority of farmers have been continuing it and becoming independent on their economy.

### **A comparative study on adoption of post harvest technologies of apple by farmers in Jumla and Mustang districts**

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Understanding the potentiality of apple to uplift the economy of people it has been more than two decades that the government has given priority to this crop in high hills. We have focused our study on apple, particularly on post harvest handling in highly potential areas i.e. Jumla and Mustang districts. Most of the respondents were found to be farmers, i.e. 76.67% and 73.33% in Jumla and Mustang, respectively. In both districts, taste and color were the major maturity indices of apple, i.e. 40% and 70% of respondents in Jumla and Mustang, respectively. Though our observation in collection center was opposite to the responses given by the farmers in respect to grading, it counted to be 60% (grading is done) in Jumla and 13% Mustang. Different types of cushions were found to be used in both districts. The types of cushion used in Jumla were 3.33%, 73.33%, 16.67% and 6.67% of chopped straw, clothes, dry leaves, no cushions, respectively whereas in Mustang 3.33%, 70% and 26.67% of clothes, no cushion, and others, respectively. Out of the total respondents, 93.3% (Jumla) and 53.3% (Mustang) had availability of storage facilities for apples. In Jumla (46.6% of respondents), and Mustang (59.26% of respondents) losses estimated during harvesting were under 0 – 5%. More than 20% storage loss was regarded the highest in both districts. In both districts, 5 – 10% loss was during transportation. It was concluded that the interrelation, linkage and correlation of apple along with the post harvest technology ultimately influenced their livelihood.

## **Effect of rice integrated crop management on soil properties and rice crop management practices in Naubise Phant irrigation system**

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Rice Integrated Crop Management (RICM) is a modified system of crop intensification and it is recently introduced in Nepal. Water management division of Department of Irrigation in collaboration with Agricultural Engineering Division of Nepal Agricultural Research Council had demonstrated RICM in Naubise Phant irrigation system (Kavre district) in 2006. To study the adaptability of RICM and its effect on soil properties and farmer's crop management practice this research was conducted in 2007. Household survey and Focus Group Discussion were conducted to collect primary data. Crop cutting survey was conducted to estimate the yield, and soil analyses were also done twice - one before rice transplant and another after rice harvest. Majority of respondents were Chhetri, and Mansuli was popular variety in the study area. Agriculture works were labour intensive as the land system is terraced flat land with irregular curve shape to rectangular shape, length and width ranging from 1 to 10 m. Soil texture was silt loam and with slightly acidic pH making rice soils much suitable for its production. The fertility condition of Rice – Potato (- Potato) was good with OM% and N% at medium level, available phosphorus at very high level and potassium at medium to high level. These make the rice production satisfactory with no fertilization at all in the existing cropping system. Partial effect of RICM on crop management was seen thereby no significant yield difference with seedlings number transplanted per hill by 37%. Both of these practices have reduced the seed rate by 28%. Unavailability of mechanical weeder as well as closer spacing made no use of mechanical weeder, while intermittent irrigation could not be possible due to frequent rainfall at later period of rice growth apart from widening the participated farmers of the irrigation system. Hence, RICM system needs full adoption in the location and appropriate IEC materials should be used in the technology transfer among the farmers.

## **Impact assessment of IPNS under maize based cropping pattern (a case study in Kavre district)**

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The study was conducted at Kavre Nityachandeshwori VDC of Kavrepalanchwok district during March to August 2007 to assess the impact of IPNS under maize based cropping pattern specifically assessing the knowledge and practices of farmers' on soil fertility improvement and to analyze the crop yield variation before and after the IPNS adoption. Total sample size for the study was 40 and sampling was done purposively in which

farmers who have not participated in the IPNS program have also been included. Data were collected by personal interview with the farmers as well as direct observation. Soil samples (40) from 0.20 cm depth were taken from maize based cropping pattern land in order to know its fertility status.

Most of the respondents reported that healthy soils, healthy crops, empowered farmers and best utilization of local resources are the main pillars for IPNS. Women farmers were more active in FFS. With the management and increasing quantity of FYM, use of cattle urine, intercropping of legumes etc there has been quantum reduction in the use of urea. However, the use of MoP and DAP was on increasing trend. This clearly indicates the awareness among farmers on the sustainable agriculture and integrated use of plant nutrient resources. There is increasing trend of local resource utilization for plant nutrient management. Soil analysis result from lab revealed that most of the soils in Kavre Nityachandeshwori VDC were slightly acidic, sandy loam with medium in organic matter content. Nitrogen content was low to medium but phosphorus and potassium were high to medium in content.

### **Causes of soil fertility decline in maize-based cropping patterns in Sindhupalchwok district**

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A field study was conducted in 2007 from March to August to monitor causes of soil fertility decline in maize-based cropping patterns in midhills area of Sindhupalchwok district. Field level simple random sample survey in 201 households was conducted and Focus Group Discussions (FGD) was organized in Mankha VDC where maize is the main crop. Twenty eight soil samples were collected and analyzed to determine soil pH, texture, OM, available P, available K and total nitrogen. Soil analysis revealed that OM content was 4.5% (medium),  $P_2O_5$  645.25 kg ha<sup>-1</sup> (very high) and  $K_2O$  395.65 kg ha<sup>-1</sup> (high) whereas total nitrogen content in soil was 0.033% (very low). Urea was widely used chemical fertiliser. Farmers did not perceive that intercropping legumes increases the productivity of the main crop and improves soil fertility. Benefits perceived from legumes intercropping included minimizations of weeds, and availability of vegetable and forage at the scarce periods. Rill and gully erosion were natural disasters resulting soil loss and subsequent soil fertility decline which was again enhanced by sandy loam texture of soil. Socio-economic problems resulting soil fertility decline included low literacy rate, lack of labour force, limited coverage by extension personnel, and small coverage of irrigation facility. Unbalanced fertilisers use, lack of FYM management, grazing management system of livestock, cereal dominated cropping patterns, lack of crop diversity were the major technical causes of soil fertility decline in the study area.



## **Nutrient status at maximum tillering stage of rice in long term soil fertility experiment under rice-wheat cropping system in Khumaltar**

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Soil nutrient status in the soil is one of the concerns of agricultural scientists and planners. National crop productivity and food security is depending on soil nutrient status in the soil. The importance of soil nutrient in the agriculture production has been looked as an issue but storage and losses of soil nutrient in the soil environment is given low priority. An experiment with RCBD, 7 treatments and 4 replications was carried out to study the impact of organic and inorganic fertilization on the soil nutrient status in the soil. Results were found highly significant and FYM 10 ton ha<sup>-1</sup> that showed higher (10.925 ton ha<sup>-1</sup>) biomass production as compared to other treatment and lower biomass was found in control plot. Higher soil organic matter, nitrogen, phosphorus and potassium content were found in application of FYM @ 10 ton ha<sup>-1</sup> whereas least nutrient was found in control plot. Detail soil analysis showed that FYM treated plot was more beneficial than other treatment. It is concluded that the study result will be helpful to obtain national sustainable production of agricultural crops; and the application of organic fertilisers instead of inorganic fertiliser will be beneficial in long run. But complimentary application of inorganic fertiliser should not be discouraged for sustainable production. Therefore agricultural scientists should give priority for application of organic manure instead of inorganic fertiliser for soil fertility sustainability.

## **Soil fertility analysis in maize-based cropping patterns of Lalitpur (a case study of Dukuchhap VDC)**

**Hemanta Sapkota**

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Dukuchhap (1100 – 1500m asl), Lalitpur is an outreach research site of Nepal Agriculture Research Council (NARC). The experiment was conducted to evaluate the fertility status of maize growing area in Dukuchhap VDC during the period from August to November 2008. The objective of the study was to find out the fertility status of the soil of different wards of Dukuchhap VDC under maize-based cropping pattern. The study was conducted on the basis of the field visits. The major textural class was found to be loamy with mean sand, silt, clay percentage as 28.9%, 49.025%, and 23.19%, respectively. The mean value of pH of Dukuchhap VDC was found as 4.355, which suggests that the soil is acidic in nature. Mean organic matter content of this place was found to be 1.66%. The mean nitrogen content of Dukuchhap VDC was found to be 0.11% which is found to be medium in total nitrogen. On an average the mean phosphorus content of Dukuchhap

VDC was found to be 48.50 kg/ha  $P_2O_5$  while the average potassium content of soil was found as 101.36 kg/ha  $K_2O$ . The study confirmed that the fertility status of the study area is on the declining state due to the imbalanced use of chemical fertilizers and use of organic fertiliser in lower amount, as well as practice of same cropping patterns for a long period. In short, Dukuchhap is a site where there is ample room to disseminate improved technology to raise the fertility status which obviously would help farmers to improve their livelihoods. It is recommended to use both the chemical and organic fertilizers in optimum level, change the cropping patterns annually, and proper use of lime for the maintenance of soil pH.

### **Soil fertility status of maize soybean-based intercropping in Methanekot VDC, Kavrepalanchwok**

**Madhusudan Poudel**

The study was conducted in Methanekot VDC of Kavrepalanchwok district of Nepal to evaluate the soil fertility status in maize soybean intercropping during the period from August to November 2008. There were four treatments viz. maize only (T1), maize and soybean (T2), maize and soybean chopped (T3), maize and soybean relayed (T4). The experiment was laid out in random block design (RBD) with six replications. Soil analysis revealed that average soil pH, organic matter content (%), total nitrogen (%),  $P_2O_5$  kg/ha,  $K_2O$  kg/ha and grain yield productivity (ton/ha) under T1 was 4.28, 1.39, 0.09, 95.33, 183.3 and 3.42 respectively. Similarly, the same value under T2 was 4.38, 1.67, 0.11, 190.83, 268.8 and 5.14 respectively and under T3 it was 5.4, 2.62, 0.17, 390, 415.7 and 6.19 respectively. In the same way, average soil pH, organic matter content (%), total nitrogen (%),  $P_2O_5$  kg/ha,  $K_2O$  kg/ha and grain yield productivity (ton/ha) under T4 was 4.68, 1.82, 0.12, 156, 292, and 4.48 respectively. The highest yield consisting both grain yield contributing parameters was found in T3 (0.619 kg/sq.m.) followed by T2 (0.514 kg/sq. m), T4 (90.448 kg/sq. m) and T1 (0.342 kg/sq. m), respectively. The fertility status of soil under the soil of different treatments revealed that the fertility status of soil in T3 was the best among all the treatments and was followed by T2, T4 and T1 respectively. The farmers perceived that the application of compost resulted in higher grain yield than that of chemical fertilisers. Soil erosion was natural disasters resulting soil loss during monsoon and subsequent soil fertility decline. Socio-economic problems resulting from soil fertility decline included lack of labor force, limited coverage by extension personnel and almost no irrigation facility. Unbalanced fertilisers uses, lack of FYM management, cereal dominated cropping patterns, lack of crop diversity were the major technical causes of constraints related to soil fertility.

## **Effect of vermicompost and NPK fertilizers on growth and yield components of amaranth**

**Dipendra K. C.**

The experiment was conducted to evaluate the effect of vermicompost and NPK fertilisers on growth and yield contributing parameters of *Amaranth tricolor* in soils of NARC experimental field during the period from August to November 2008. The land was medium fertile and pH was 4.7. There were five treatments viz. control (T1), vermicompost (VC) 10 t/ha (T2), VC 10 t/ha + 50% NPK (T3), VC 10 t/ha + 100% NPK (T4), 100% NPK (T5). The experiment was laid out in complete randomized design (CRD) with four replications and 100% doses of N-P-K were 25-15-20 kg/ha. Application of vermicompost and NPK significantly influenced the growth and yield of amaranth. The 10 t/ha vermicompost (T2) showed better growth and yield than 100% NPK (T5) in amaranth. The highest yield contributing parameters were found in T4 followed by T3. But both were more or less statistically similar, and the lowest yield contributing parameters were recorded in control (T1). Application of fixed amount of vermicompost (10 t/ha) with NPK fertilizers (50% and 100%) increased the vegetative growth and yield of amaranth. The highest fresh weight increased by T4 (195.34%) followed by T3 (149.31%) over control. The fresh weight of amaranth had significant and positive correlation with: plant height ( $r = 0.956^{**}$ ), number of leaves/plant ( $r=0.974^{**}$ ), leaf breadth ( $r=0.950^{**}$ ), stem length ( $r = 0.989^{**}$ ) and total dry weight ( $r= 0.988^{**}$ ). The result showed that effects of vermicompost are more efficient for the vigorous production of red amaranth. It is also suggested that vermicompost (10 t/ha) + NPK (100%) is more favourable for vigorous production of amaranth and maintenance of soil environment but vermicompost (10 t/ha) + NPK (50%) can be economically and environmentally suitable.

## **Comparative study of soil fertility status of different forest types under community forest and upland soil at Bhimeshwor municipality, Dolakha**

**Parshuram Rimal**

A field investigation was conducted from August to November 2008 to compare the status of soil fertility under community forest and upland soil in midhills area of Dolakha district. Field level simple random sample survey in 30 households was conducted in Bhimeshwor municipality 6, Kiratichhap, Dolakha. Soil analysis performed in the laboratory revealed that average organic matter content (%), total nitrogen (%),  $P_2O_5$  kg/ha, and soil pH under pine forest was 0.63 (very low), 0.04% (very low), 36.5 kg/ha (medium), 294 kg/ha (high) and 4.1 (strongly acidic) respectively. Similarly, the same value under mix forest was 1.2, 0.08%, 287.8 kg/ha, 277 kg/ha and 4.4 respectively. In

the same way, average organic matter content, total nitrogen (%),  $P_2O_5$  kg/ha, and soil pH under fertile *bariland* was 1.79, 0.11%, 668.1 kg/ha, 386 kg/ha, 6.6 respectively and under unfertile *bariland* it was 1.34, 0.09%, 70.5kg/ha, 134 kg/ha 4.7 respectively. Soil fertility analysis showed that average organic matter content under pine forest was very low, and it was low in mixed forest and unfertile *bariland* but it was medium in fertile *bariland* and broad leaved forest. Similarly total nitrogen% in the soil of pine forest was low but was medium in mixed forest, broad leaved forest, fertile *bariland* and unfertile *bariland*. In the same way  $P_2O_5$  kg/ha was medium in pine forest, high in unfertile Bari land and was very high in fertile *bariland*, mixed forest and broad leaved forest respectively. The soil pH under the different soil revealed that the soil under pine forest and mixed forest was strongly acidic, it was moderately acidic under broad leaved forest and unfertile *bariland* but it was nearly neutral in the soil of fertile *bariland*. Socio-economic problems resulting from soil fertility decline were low literacy rate, limited coverage by extension personnel, and lack of irrigation facility, unbalanced fertilisers use, lack of FYM management and lack of crop diversity. However protection, management and utilization status of the community forest was found satisfactory.

### **Soil fertility evaluation of maize legume intercropping pattern in Methanekot VDC, Kavrepalanchwok**

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The experiment was conducted during the period from August to November 2008 in Methanekot VDC Kavrepalanchwok district to evaluate the soil fertility status of maize legume intercropping. There were five treatments viz. maize (monocropping) (T1), maize and cowpea (T2) maize and *Sesbania* (T3), maize and bean (T4) and maize and ricebean (T5). The experiment was laid out in simple random block design (RBD) with six replications. Soil analysis revealed that average soil pH, organic matter content (%), total nitrogen (%),  $P_2O_5$  kg/ha and  $K_2O$  kg/ha under T1 was 4.40, 1.37, 0.08, 97.59, 193.93 and 2.6 respectively. Similarly, under T2 was 5.21, 2.49, 0.16, 307.71, 389.7 and 4.9 respectively, and under T3 it was 4.82, 2.08, 0.13, 234.31, 274.23 and 4.1 respectively. In the same way, soil pH, organic matter content (%), total nitrogen (%),  $P_2O_5$  kg/ha and  $K_2O$  kg/ha under T4 was 4.95, 1.54, 0.10, 289.79, 315.51 and 3.1 respectively. And the value for T5 was 5.62, 1.59, 0.107, 244.19, 298.45 and 5.7 respectively. The highest grain yield was found in T5 (5.7 t/ha) followed by T2 (4.9 t/ha), T3 (4.1 t/ha), T4 (3.1 t/ha) and T1 (2.6 t/ha). NPK content was found high in T2 and the lowest in T1. Soil erosion was natural disaster resulting in soil loss during monsoon and subsequent soil fertility decline. Lack of labor force, limited coverage by extension personnel, and no coverage of irrigation facility were the socio-economic problems that resulted from soil fertility decline. The major technical factors responsible for the problems related to soil fertility included unbalanced fertilisers use, lack of FYM management, cereal dominated cropping patterns, and lack of crop diversity.

## 4 Plant Protection

### Adoption of crop protection technology by the farmers of Madhyapur, Thimi

Sony Shrestha

An exhaustive study entitled “Crop protection technology adoption by the farmers of Madhyapur - Thimi” was conducted in July 2004 with the objective of documenting the crop protection technology adopted by the farmers. The farmers of Madhyapur, Thimi considered pests and diseases as major bottlenecks of decreasing soil productivity. Aphid was recorded as main pests by 82.3% of respondents. Similarly wilt disease in chilli and late blight disease of potato were recorded to be major ones among all diseases. It was found that farmers have been using pesticides either singly or in mixtures of two or more types of pesticides with or without mixing plant growth regulators to keep down pest with or without prior knowledge of pesticides. A total of 76% of the respondents were found using pesticide mixtures of two or more types. Nuvan, Metacid and Dithane M-45 were commonly used pesticides in the study area. Majority of farmers responded that they initiate pesticide application once pest and diseases are observed while very few applying pesticide as a prophylactic measure. They give priority to potato and leafy vegetables for applying pesticides. Only 48% of the respondent reported using protective clothing including mask and boot. Different types of pesticide poisoning such as headache, fever, vomiting, eye irritation, respiratory problems, stomachache etc. were reported by the respondents out of which headache as the pesticide related disorder ranked first by majority of farmers (71.3%). A large chunk of the farmers (>80%) were found unaware of the banned pesticides and their impact. A total of 60% respondents had knowledge about the beneficial organisms and their role to keep down pests and improve soil fertility. Uses of botanicals (*neem*, chinaberry, sweet flag, tobacco etc.), wood ash, cow urine etc. are reported as alternatives to chemical pesticides by some respondents. Out of those who have seen good prospects of these alternatives, a total of 82.2% has been using wood ash as an alternative. Pesticide retailers of the study area have not registered formally yet they have been selling pesticides. Due to the lack of knowledge on pest management and safe use of pesticide, pesticide related problems were found mounting and the time has come to combat these problems by expanding pesticide education to producers and sellers.

## **Occurrence of insect pests in vegetable crops and their management practices followed by the farmers of Sipadol VDC, Bhaktapur**

**Dhiraj Puri**

The field study was carried out during March to July 2004 to find the occurrence of insect pests in vegetable crops and their management practices initiated by the farmers of Sipadol VDC. Through simple random sampling, a total of 30 households were selected and data were collected by schedule method. In recent years, vegetable production is becoming a viable agro-enterprise among the farmers as it generates handy income and provides farm employment. However, the study area was not remained aloof from the attack of insect pests which frequently posing the serious problem. The summer crops were found more vulnerable than winter vegetables. Repeatedly occurring pests are potato tuber moth (*Phthorimaea operculella*), cabbage butterfly (*Pieris brassicae*), aphids (*Lipaphis erysimi*), cutworms (*Agrotis* spp.), diamond back-moth (*Plutella xylostella*), hairy caterpillar, tomato fruit worm (*Helicoverpa armigera*), pumpkin beetles (*Aulakophora* spp.), flea beetle (*Phyllothreta* spp.), mites, spotted beetles (*Epilachna* spp.) etc. The severe occurrence was due to the result of monocropping of vegetable in large areas, skeptical towards crop rotation and ignorance of farmers towards efficient and friendly pest management practices in the field. It is also found that farmers have been practicing traditional ways of pest management and some of them are using pesticides without knowing the adverse effect of these pesticides. Integrated pest management approach has not realized by the farmers and there is the need to inculcate the knowledge and skills of integrated pest management to the farmers so that they can control pest vis-à-vis maximize the production with better quality.

## **Farmers' knowledge, attitudes and practices on IPM in summer vegetable crops in Sipadol VDC of Bhaktapur district**

**Kiran Ghising**

The study was carried out at Sipadol VDC, Bhaktapur during May –July 2004 with the objective of assessing the knowledge, attitude and practices among the farmers towards integrated pest management by purposively selecting 30 households; and a majority of data were taken through schedule, focus group discussion and key informant interview. The site was selected because the farmers of this VDC have been growing vegetables since the long time for their livelihood. A majority of the respondents responded that their summer vegetables were heavily infested with pest and hence they were losing a bulk of produce each year. Majority of the farmers have been using chemical pesticides as one of the most potential pest control means albeit they are aware of hazardous effects of these chemicals. Despite the lack of alternative means over chemical control, farmers have other options to control pest such as use of *neem*, *titepati*, *bakaino*, tobacco as the

natural plant extracts, use of cow urine and soap water. However, a majority of the farmers were less aware with such alternatives and modest number of them feels such practices as tedious ones in application and effectiveness. It was also recorded that IPM approach in the study was lately intervened since the beginning of 2003. Deliberate adoption of the IPM activities was very less although a good mix of traditional and chemical pest control. Very slow pace of adoption of IPM might be due to the present land ownership pattern since peasant agriculture is found to be common. Very poor linkage among the governmental and non-governmental organizations in promoting IPM approach in the study area is the futile ground reality.

### **Study on organic pest management on vegetable crops at Riyale VDC, Kavre**

**Prakash Bikram Shah**

The study was initiated during March to June 2004 at Riyale VDC, Kavrepalanchowk district focusing on organic pest management (OPM) in vegetable crops by purposively selecting 40 households and collecting the data through structured interview. It is dug out that several organizations like WACN, SSM-P and ADRA Nepal have been rigorously providing information and skills related to organic vegetable production and ill effects of inorganic inputs. So a bulk of the respondents was found growing organic vegetables. The farmers are found to have awareness level on the adverse effects of chemical pesticides on human health and environment so they have been using organic measures of pest control. Most of them have been found using an optimal mix of cultural, physical, botanical and animal urine as the best pest control strategy. Among botanicals, *neem* and tobacco were much used by the farmers and they were applying botanicals in the form of *Jaibik bisadi*. Pest like aphid, caterpillar etc have been controlled using these botanicals. They responded the slow effect and tedious jobs to prepare these botanical pesticides are the major bottlenecks behind them. The problem of botanicals has also been compounded with the lack of these plants in their locality. Ipsa facto, it could be revealed that farmers of the study area are in the embryonic stage so far as the OPM is concerned.

### **Indigenous knowledge of farmers for the management of insect pests and diseases of agricultural importance**

**Sekhar Pathak**

A study was conducted at Gokarna VDC during March – July 2004 to document indigenous knowledge of farmers on crop pests and diseases management for which a total of 30 households were selected randomly; and effort was made to collect information related to socio-economic, demographic attributes and existing crop production practices through interview technique. Household survey revealed that some farmers have been enjoying with indigenous knowledge of pest and disease management

in agriculture. Almost all farmers have been employing indigenous knowledge to manage insect pests and diseases of grain crops like rice, maize and millet. A unique method of hanging dead body of animals near the field is the common practice used by the farmers to control pests of rice crop. Plant extracts are being sprayed commonly to manage blast, rice bug, stem borer and leaf roller on rice crop. Some farmers reported that they usually comb the rice leaves using branches of *Aiselu* and bamboo in order to manage leaf roller. Similarly, farmers usually remove pest and disease attacked plant during intercultural operations to reduce further spread of pest into the crop field. Rice pests like bugs and hoppers are effectively managed by burning lamp in the field. A farmer was found to have practiced keeping stem of *Khirro* (*Sapium insigne*) plant at water logged rice field to manage leaf roller and blast. Wood ash is commonly used in vegetable crops to manage different types of crop diseases/pests. There was a practice of spraying wood ash solution to manage leaf blight occurring on potato and other vegetable crops. Farmers also reported that red ants and aphids are also managed by applying wood ash. They usually clean terraces and bunds with the purpose of managing insect pests and diseases.

### **Impact of integrated pest management farmers' field school training on pests management strategies in rice production in Kavrepalanchwok district**

**Sita Thapa**

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The study was conducted in Kavrepalanchwok district of Nepal. The specific objectives were 1) to find out the socio-economic characteristics of the participating farmers, 2) to find out the practices followed by the participating farmers for healthy rice crop production, 3) to find out agro-ecosystem analyzing capacity of the participating farmers, and 4) to find out the perception of the participating farmers on the use of agro-chemicals. A survey method was used to collect data using both open ended and close ended questionnaires. The respondents were randomly selected from five farmers field schools (FFS) groups trained before 2064 B.S. rice cropping season, 10 from each group making a total of 50 farmers. Education level, landholding size and income sources were found significantly related to the pest management strategies followed by the farmers in their farms. The farmers were found aware about the feeding habits of the insects and their categorization as harmful and beneficial as well as weeds and diseases. About 50% farmers were found practicing healthy rice production following IPM principles. Most of the farmers (84%) visited their field weekly but the observations made by 68% farmers only matched with the third principle of IPM i.e., decision making observations. The study revealed that farmers were well aware about the ill effects of the chemicals applied in the field. Overall findings revealed that farmers after being trained in FFS, practiced most of the activities of healthy rice production in their farms. Farmers learned the principles of IPM during FFS training and become able to apply them in their fields.



## **Comparative effectiveness of pest management practices under bio-intensive farming system and conventional farming system in Udayapur district**

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The use of synthetic pesticides in crop protection programs around the world has resulted in disturbances to the environment, pest resurgence, pest resistance to pesticides, and lethal and sub-lethal effects on non-target organisms, including humans. These side effects have been seen in various part of Nepal. Keeping this problem in mind, reducing dependence on chemical pesticides in favour of sustainable agro-ecosystem management is a good strategy for the small farmers. One of the eco-friendly approaches is bio-intensive farming system (BIFS). This study was therefore conducted with a semi structured questionnaire interview with 50 sample population to assess the comparative effectiveness of pest management practices under BIFS against the practices used in and the conventional farming system (CFS). The study was conducted during September to October 2008. There was found increased trend of chemical pesticide use in vegetable crops under CFS. Misuse and overuse of pesticides has developed resistance of pest which had led lower yield in CFS, while BIFS adopting farmers had more yields, which was due to lower pest attack or lower incidence of pest. The severity of pest damage was also increasing in case of CFS than that of BIFS. Awareness programme against the hazardous effect of pesticides and eco-friendly packages of the integrated pest management (IPM) was found in infant stage among CFS adopting farmers which has resulted several problems regarding to yield, health, expenses, and dependency in external inputs. In case of BIFS, majority of the farmers were found gradually minimizing the use of chemical fertilizers replacing them with organic manure. Those farmers had positive altitude and were aware about environmental degradation and their health problems and ecological disturbances caused by the high use or misuse of chemicals so, these farmers were using various indigenous materials and techniques (compost, cattle urine, botanical pesticides, ash, scientific crop rotation and mixed cropping) that do not harm to their health and environment but improve soil fertility, decrease pest incidence, and increase yield.

## **Club root Management on Cruciferous Crops in Bhaktapur District**

**Amrita Poudel**

A field experiment was conducted in 2008, April – November to find out the alternative of club root management in Bhaktapur district. Cultivation of *Brassica* vegetables is one of the most potential income generating sources for the farmers' livelihood over there. Due to introduction of hybrid varieties suitable for off-season production, intensive cultivation of cabbage crops has been employed. Club root disease caused by

*Plasmodiophora brassicae* is one of the serious limiting factors at Kathmandu valley, Palung valley, Daman and Kavre district. The disease has been spreading rapidly through movement of symptom less infected seedlings grown in an infested field and through farm implements. Intensive cropping of *Brassica* crops, limited knowledge of farmers on diseases and its pathogen have favored the rapid building up of inoculum density in the soil. It is very difficult to control the disease once it's established in the field due to longer viability (more than 18 years) of its resting spores in absence of *Brassica* hosts. Wilting, yield losses, and aesthetic consideration for the fresh market (for garden cress, turnip, radish and knolkhol) are associated with clubroot diseases. Increase in club root index attributed in yield loss both in biomass and curd weight. The disease could cause yield loss of 27 - 81% in total biomass and 18 - 87% in curd yield of cauliflower, however 100% crop loss also has been observed. This field study was conducted with 5 treatments and 5 replications and analyzed with M-STAT. Concerning management, lime application to raise pH of the soil nearly to 7, use of seedling not less than 7-week-old, biological control agent as "Jeewatu" application reduced disease severity and incidence significantly. If biological agent is applied at a time could give satisfactory management of this disease below economic threshold level. Overall, it has appeared to be a challenging disease for cultivation of *Brassica* crops in Nepal due to absence of host resistance and unavailable other effective and sustainable control measures.

### **Clubroot management practices in Bajrabarahi and Chitlang VDCs of Makwanpur district**

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Clubroot has been a serious problem in Cole crop production. This study was conducted in Makwanpur district with the objectives of finding out the socio-economic conditions of Cole crop growers to record the clubroot disease damage and to know the management practices followed by the farmers. Sixty respondents were purposively selected from two VDCs i.e. Bajrabarahi and Chitlang of Makwanpur VDC. Primary data were collected using questionnaire survey, key informant interview and focus group discussion. Majority of the farmers preferred to grow vegetable crops due to its high productivity and high economic returns. For the proper growth and development of the crop the farmers frequently used FYM, urea and also used Multiplex as micronutrient. The major production constraints faced by these farmers was associated with pests and diseases. After the clubroot disease invasion the production level decreased greatly. According to the study, majority of the farmers reported seed and soil as a major source of disease transmission. For the control of the disease most farmers followed crop rotation. According to the respondents, the clubroot disease infections were more in cauliflower as compared to other Cole crops. Farmers used ash, cow urine and *Banmara* as local treatments but that has helped to get rid of the disease to less extent only.

## **5 Agri-Economics and Agri-Business Management**

### **Milk production and marketing systems in Kavre district**

**Dinesh Dhungana**

The study of milk marketing systems in Kavre district was done to find the constraints and opportunities with which milk producers have been facing. Though farmers of Kavre district responded that they have been generating significant income from the sales of milk and the road linkage had widened the market opportunity, it was not so in reality. Due to high production cost, insecure market, shortage of feeds and fodder, high incidence of diseases, lack of skilled manpower and quality services, and the economic benefit from this sector was far from satisfactory. These problems could be curtailed to some extent if the proper marketing policies are hammered out, providing knowledge to local farmers on milk production, animal health and improved feeds and feeding practices and services of skilled manpower made available. The study also reveals that an average per day per milch dairy animal, in case of small household with few animals reared, net maintenance cost was relatively higher than the average per day net maintenance cost of one dairy animal reared in big household with more than one animal. It is evident that average total cost is a decreasing function of number of dairy animals. Similarly, annual net profit of average household size was observed Rs 32596.12. It was of course not much remunerative to the large farmers albeit it was found positive. Farmers who had no option of conducting other business besides raising few dairy animals were observed as marginal ones. They were always facing with their own financial problems and were concerned with two squares of meal. Therefore, they were not bothered about increasing milk production by selecting superior breed. Their only purpose of raising animal was to get milk for their family consumption and to obtain manure so as to reduce the use of chemical fertilizer in their land. Hence, the livestock plays an important role in manuring their field and thereby minimizing their expenses on chemical fertilizer. This explanation clearly reflects that there is a dire need for changing and implementing the existing policy of the government for the upliftment of marginal farmers. The small farmers responded that either the price of their produce should be raised or interest charge on loan should be decreased to benefit them. The other avenues for earning more profit from dairy animals were genetic improvement, credit facilities and marketing support.

### **Production and marketing systems of poultry in Kavre district**

**Sarad Nepal**

In recent years poultry industry, in its position as a branch of agribusiness, has emerged as an encouraging enterprise for many farmers and entrepreneurs in urban and sub-urban areas of the country including Kavre district. It has witnessed considerable investments,

which is reflected by the growing numbers of poultry farmers. Along with the increment in poultry production, infrastructure development has gained momentum during the last few years in Nepal however, production situation has meagerly assessed. Thus present study regarding scale of production, management practices and marketing systems of poultry business was carried out in Kavre district. To render the study, the households were divided into three strata viz. farmers growing less than 500 birds (small scale), 500 to 1000 birds (medium scale) and greater than 1000 birds (large scale). A total of 90 poultry growing households were selected randomly from each stratum with 30 samples representing each stratum. Cost per unit of bird and IRR has been used in this study as an indicator to examine the economic situation of a poultry business. The average variable cost and average fixed cost per bird for small, medium and large categories of flock sizes of broilers were Rs. 146.68, 140.61, 143.83 and 4.18, 3.38, 3.94, respectively. Similarly the IRR for three different categories were 1.01, 1.14 and 0.99. Similar was the case of layers with IRR for three different flock sizes which equaled to 1.08, 1.15 and 1.05, respectively. This situation may be aggravated to the poor managerial skills of farmers on record keeping of cost items, heavy investment in feed and medicines, poor housing systems leading to parasitic diseases and high mortality of chicks. Similarly, even the management systems of the large-scale farmers was not satisfactory as majority of them were not fully adopting scientific management practices and making unnecessary high investments on feeds, housing and equipments. As a result of this, farmers are not been able to derive anticipated benefits from the poultry business. The study shows that majority of the poultry farmers in three sites of Kavre have not been receiving any significant supports from the concerned public extension agencies and lack basic technical know-how on improved poultry keeping.

### **Economics of cauliflower marketing of Jiling VDC of Nuwakot district**

**Sabita Khadka**

A study of cauliflower marketing with special reference to economics was taken out at Jiling VDC of Nuwakot district. The cost of cauliflower production was equaled to NRs. 2418.3 per *ropani* while gross and net incomes were NRs. 5200 and 2781.7 respectively. The cauliflower enterprise was found to be profitable since marketing cost per kg of produce equaled to NRs. 2.64 and B/C ratio was 2.15. The average area and total production of cauliflower were 0.43 ha and 10.86 t/ha, respectively. Farmers used to explore the market information themselves. Duplicate and inferior quality seeds were found to be the most awkward ones in the study area. Most of the farmers are unaware of proper packaging, market information, marketing channel and other post harvest operations of the cauliflower. High cost of transport, lack of market information, rudimentary market structures, lack of post harvest skills etc are the key areas to be immediately hit on for enhancing the economy of the vegetable growers. Besides these, government should establish collection center and provide storage and easy transportation facilities in the study area so as to brighten the economy through vegetables.

## **A study on economic benefit of trout farmers of Nuwakot district**

**Samridhdi Paudyal**

Fisheries sector is becoming one of the potential economic activities in Nuwakot district. Some of the farmers of Nuwakot district have initiated this business however their economic enhancement has yet to be traced. The study to find the economic enhancement of the farmers involved in exotic cold-water fish (*Onchorhynchus mykiss*) was conducted at potential areas of Nuwakot district where only four farmers were found to be involved in this area. The B/C ratio of this farm business was ranged from 1.024 to 1.66. It may be due to high cost for the feed which made the production cost high. The cost of production of government farm is about Rs. 170/kg but at farmer level it is about Rs. 250/kg. The selling price of the trout is about Rs. 300 to 600/kg depending on the time and consumer type. Trout cultivation has wide scope within as well as outside the country. Neighboring countries like India, Pakistan, Bangladesh, Thailand and China has wide demand of it. Though the main market of the trout is not well specified, big hotels and restaurants and some of the diplomatic groups with high income level prefer it. Marketing channel of this fish business was found very simple, that is, producer to consumer without any intermediaries. Transportation system is so simple since fresh meat is consumed and it is transported through local vehicles by packing in the plastic crate with ice. Through the study it can be said that there is immense scope of enhancing economic level of the farmers through trout business if the farmers are provided with loan facility, technical backstopping and related inputs.

## **A study on fresh milk marketing in Kavre district**

**Pratima Gnawali**

Livestock is one of the major sub-sectors of the agriculture, which contributes nearly 33% to AGDP. Milk production contributes about 50% to livestock GDP, and it is a major income source of the rural and peri-urban farmers. The study was conducted to assess the milk marketing system in Kavrepalanchwok district. Primary information was collected from five diary cooperatives, five dairy companies and 50 farmers in 2008. There were about 40% cows and 60% buffaloes in the 50 sample farms, of which 39% cows and 42% buffaloes were improved. On an average, milk producing farmers produced about 10.69 litre milk per day of which 8.13 litres (76.05%) were marketed and 2.61 (23.95%) litres were consumed at household. Farmers were found selling fresh milk directly to different agencies. About 68% of the farmers sold milk to venders, 8% to dairy cooperatives and 24% to private dairies or DDC. Venders used to sell to both private dairies and diary cooperatives. Dairy cooperatives then sold milk to dairy companies and/or directly to market. Private dairies and DDC use to sell to market. About 14% farmers used to cull 25.37% of the milking buffaloes immediately after lactation. Culling of buffaloes after dry is main problem leading to monetary loss (net loss per buffalo is Rs. 892) and loss of genetic material, which is a national issue. Major causes of buffaloes

culling are attraction of farmers in short term cash benefit and problem of feeding and raising them. Major problems faced by the farmers in milk marketing were identified as unhealthy competition among dairies and "Chhakajam"; and load-shedding. It is suggested that milk marketing system should be improved by solving the problems of farmers and concerned market intermediaries. Likewise, a comprehensive program should be implemented to retain the valuable improved buffaloes in the districts.

## **Vegetable marketing and its information system in Kathmandu Valley**

**Sudarshan Kumar Aryal**

A study was conducted in Kathmandu valley during May to July 2005 to assess the role of agricultural market and its information system in vegetable marketing. The total sample size for the study was 160, out of which there were 60 farmers, 40 traders and 60 consumers. A representative sample of 60 farmers was selected from commercial vegetable growers of Sipadole Village Development Committee of Bhaktapur District using a simple random sampling technique. Farmers were categorized into small farmers, medium farmers and large farmers for analysis. Similarly, 40 traders were selected comprising 20 each from wholesalers and retailers; and they were interviewed to gather information on marketing information system. Likewise, 60 consumers 20 each from Kathmandu, Lalitpur and Bhaktapur districts were selected for telephone interview. The result showed that vegetable farming was the major source of income. Farmers were increasing area under vegetable farming; and cauliflower was the major vegetable during the study period. The previous year farm gate price of cauliflower positively contributed in the area allocation of the current year. Most of the farmers and traders in the study area were getting information on marketing through different sources. However, the level of satisfaction was unsatisfactory. In the study area, majority of the farmers used to hear the market price bulletin broadcasted by Radio Nepal. But those farmers were not satisfied with the information provided. Majority of the consumers (53 %) bought vegetables in every alternative day. The satisfaction level of consumers towards availability of vegetables was found very low. Farmers of the study area were facing several problems in marketing of vegetables. Among them, fluctuation in market price was the most important followed by inappropriate market price, and unorganized market. Similarly, traders of the study area were facing several problems in marketing of vegetables. Lack of market information was the major problem followed by *Nepal Bandha* and lack of storage facilities. The study has recommended adopting market-oriented policy and programs linking with the production in order to enhance production and marketing efficiency in the study area, in particular, and in similar environment of the country, in general.

## **Vegetable seed marketing in Kathmandu valley**

**Santosh Pandey**

The broad objective of the study was to assess the current marketing situation of the vegetable seeds in Kathmandu valley. The specific objectives of this study were to assess the factors affecting demand of vegetable seed in Kathmandu valley, to explore the sales trend of major vegetable seeds, to assess marketing system of vegetable seeds in Kathmandu valley, and to identify the constraints related to vegetable seed marketing in Kathmandu valley. The total sample size for the study was 30 out of which five were vegetable seed wholesalers and 25 were vegetable seed retailers. In course of selecting wholesalers, simple random sampling technique was used. While drawing retailers' samples primarily the all retailers residing in Kathmandu valley including all three districts were divided strata wise then retailers belonging to each stratum was selected by using the method of proportional allocation. Likewise the total 30 traders including wholesalers and retailers were selected for the direct face-to-face interview. The result manifested that vegetable seed production was undertaken in different districts of various development regions of Nepal. Kathmandu valley, one of the biggest market of the vegetable seed from the view of vegetable seed marketing due to being residing area of biggest importers and seed companies. The SSSC is the only seed company inside the valley that is working on the promotion of the Nepali local seeds with quality packaging and labeling. Most of the traders were involved in the trading of agricultural inputs like pesticides, micronutrient and equipment along with the vegetable seeds. Majority of the trader's were performing pre-contact with the local seed growers inside the country for the supply of the local seeds. While in case of the hybrid seeds, the major insourcing countries were Japan, Korea, Denmark, China, and India. The trend of using hybrid seed inside the valley in the last three years was found increasing rapidly. The price and quality was found to be most important factor affecting demand of the vegetable seed inside the Kathmandu valley followed by the income of the farmers, whereas price instability was least significant factor affecting demand of the vegetable seed. Among the major vegetable seed and in their varieties highest retailer's margin were seen in case of the hybrid varieties of vegetable seed whereas in case of local varieties the retailer margin was low and unpredictable and varied with the situations. In case of the sales trend of cauliflower, cabbage and radish, the highest value of sales was seen in case of the radish seeds followed by cauliflower and cabbage, respectively. However, in case of the cauliflower seed, sale of the local cauliflower seed was decreasing during the last two years, while in case of hybrid it was increasing during the last three years. However the sales volume of the local radish seed was increased during the last three years. Traders were facing several marketing problems and the major problems included lack of quality seed, lack of concrete policy from the government sector and lack of support measures from the private agency to promote and develop effective and efficient marketing system. The study suggested that government sector should strengthen the quality monitoring to maintain check and balance on export. Similarly public – private partnership on

production aspects of hybrid and improved vegetable seeds is necessary to cut down the import coupled with quality and quantity monitoring of market management.

## **Marketing of milk and milk products in Kathmandu valley**

**Shashi Adhikari**

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Dairy sector contributes about 50 percent of livestock GDP in Nepal. The demand of milk and milk products in Nepal is increasing rapidly. Although there are a number of dairies operating in the valley, the demand of milk and milk products is not met yet. The study focused on present milk marketing system and the problems faced by dairy enterprises. The study was conducted in three districts of the Kathmandu valley with the main objective of exploring the marketing system of milk and milk products in Kathmandu valley. The dairy enterprises having processing capacity of more than 300 liters per day of milk were selected to obtain primary information. The study was conducted in 2007. The marketing system of four milk products viz. ice-cream, paneer, *khoa* and cheese were studied. Private dairies were found more in number in Kathmandu valley (82%), followed by corporation and public company (each 9%). Of the total respondents of the enterprises, almost all were men. The major physical facilities owned by sample dairies were packaging machines, boilers, cream separators, homogenizers, and cold stores. Majority of the dairy enterprises produced fluid milk. However, they also produced milk products like paneer, ghee, and ice-cream. It was found that 42% of the dairies produced ice-cream, 33% produced cheese and 25% produced paneer. The study found that large volume of milk is supplied to Kathmandu valley from Kavrepalanchok district (80,147 l/day), followed by Chitwan (48,000 l/day) and Nawalparasi district (35,000 l/day). The least volume of milk was found to be supplied from Bhaktapur district (5000 l/day). The Dairy Development Corporation (DDC) is the leading dairy industry in Nepal which processed 130,000 l milk per day. The Sitaram Gokul Dairy was the leading private dairy producing large volume of processed milk (26,000 l per day) among the private dairies in Kathmandu valley. DDC used more number of road milk tankers. Among the private dairies interviewed, the Himalaya Dairy used more road milk tankers for the collection of the raw milk. Farmers delivered raw milk to MPCAs of DDC located at different districts. Milk is then transported to processing plants mostly by insulated road milk tankers. The channel for processed fluid milk and milk products was different. The processed milk was mostly sold to booths. While the milk products like cheese, paneer and ice-cream were sold through commission dealers. Now the DDC has opened Franchise shops which sell only the DDC products directly to the consumers. Private sector dairies collected milk mostly from cooperatives situated nearby. However, some dairy industries like Himalayan Dairy, Sitaram Gokul Dairy collected milk from distant places. The sales centers of private dairies were mostly in showrooms and the dealers. Their products were sold to nearby markets. The price paid to farmers depended on the different parameters like fat level, total solid and distance for transport. The average cost of production of whole milk was found to be R. 24 per liter. Among the



marketing costs of milk, transportation, packaging and storage costs were found to be high. The major problems faced by dairy enterprises were unhealthy competition among dairies, lack of good pricing system, high electricity charge and lack of road milk tankers.

### **Value chain analysis of incense sticks and economic empowerment of MEDEP targeted groups in Dhanusha and Sindhuli districts**

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A field-based study was conducted from August to November 2008 in Dhanusha and Sindhuli districts with the broad objectives of analyzing the value chain of incense sticks and its role in economic empowerment of MEDEP targeted groups. Purposive, simple random sample survey covered altogether 102 enterprises (including incense sticks and their ancillary enterprises) conducted in the study area. The study revealed that the entrepreneurs were unable to produce raw incense sticks as per demand due to limited availability of raw materials and low purchasing capacity of raw materials. Incense sticks enterprises contributed Rs. 3,286 (38%) on total income of the respondents, and involved more than 1800 actors directly or indirectly in different activities, enterprise and utilized their time on economic activities. The study showed that enterprises played a great role on economic upliftment of entrepreneurs and increased their level of empowerment to some extent.

### **Group dynamics in livestock development: a case study of Tanahu district**

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Group approach as a tool, was introduced in Department of Livestock Service (DLS) for effective livestock extension. The approach is still valid, it is continued in the Community Livestock Development Project (CLDP), an ADB assisted project of the DLS. The present study was conducted in Tanahu district with the objective of assessing the group dynamics in livestock development. Tanahu district was selected purposively as the district is one of the leader ILP districts of the CLDP. A total of 50 respondents, who were the members of livestock groups/committees, were selected using simple random sampling techniques. A pre-tested structured questionnaire was used to collect information. Three farmers' committee level focus group discussions were also conducted. In addition, one district level interaction workshop with stakeholders was carried out. Secondary information was also collected from different sources. The results obtained from the desk study were also verified during the field studies. The analysis of inclusiveness bound on 17 committees involved in 2063/64 revealed that there were 50/50 percent involvement of men and women in the livestock groups. Maximum

involvement was observed by other caste groups (51%) followed by Janajati (32%) and Dalit (17%). There were a total of 967 members in 17 committees in FY 2063/64. The livestock group formed in Tanahu district from Third Livestock Development Project (TLDP) period was found at increasing rate (22% per year). Male groups were at decreasing rate (7%), whereas female and mixed groups were at increasing rate by 37% and 24%, respectively. It was found that social mobilization, programme support, need of people and homogeneity, unity, training, knowledge, skill and participation are the strong factors which significantly influence the groups/committees' formation and dissolve. The majority of respondent's capacities on leadership, technical knowledge, skill, attitude, management of livestock were found moderately improved. By joining the groups, the farmers have built up their capacity, knowledge and improved their livelihood. The study showed that livestock play important roles in household income and livelihood of the farm communities. It can be concluded that the group approach is important for livestock development in Nepal.

### **Economic analysis of existing micro-enterprises for poverty alleviation in Kailali district**

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Micro-enterprises are considered good way of reducing poverty on the top of empowering the disadvantaged people. Present study focused on the economic analysis of micro-enterprises for poverty alleviation among the poor people of different VDCs at Kailali district through household survey employing stratified and multistage sampling selection of 75 respondents from different enterprise groups promoted by the MEDEP. The study was done for the comparative study of existing micro-enterprises and also to analyze the role of microenterprises to increase the family income, profit and the utilization of the income in different productive and household works. Five VDCs and one municipality of Kailali district were selected for household survey. This study was mainly based on primary data; and the secondary data were obtained from study area as well as from different sources. The field survey was conducted from 2<sup>nd</sup> Ashwin and ended 15<sup>th</sup> Ashwin, 2065 B.S. The introduction of microenterprises has brought positive changes in the livelihoods of the people. The poverty parameters like income, social respect position in the society, food quality diet, social gathering, general household cleaning, etc. were found to improve to an extent. The enterprises like *tika*, fish, and honeybee were found to be in profit even by the input value of the labour cost i.e. with the B/C ratio of 1.32, 1.31, and 1.12, respectively. Similarly, without including labor cost, the enterprises like bamboo, tailoring, *tika*, vegetable, *dhakiya*, honeybee, fish, incense stick were found to be profitable with the B/C ratio of 8.58, 4.75, 4.56, 2.73, 2.52, 2.33, 1.87 and 1.47 respectively. The candle business was found to be in loss. By intervention of MEDEP the entrepreneur were able to generate their own income, which has been helpful for their day to day expenses. Therefore, it is concluded that the enterprises are of high potential with higher national and international demand in the context of Kailali.

Working together in a group as per the requirement can help in poverty alleviation and economic empowerment of entrepreneur in future days.

### **A case study on impact of pass on programme in Lamjung district**

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Goat pass – on program is a major income generating program being implemented by the Community Livestock Development Project (CLDP)/DLS. The study was conducted owing to the need of assessing the impact of goat pass-on program in Lamjung district in 2008. The information was collected from 240 households by using simple random sample survey. There are 15 goat farming committees under goat pass-on program with 752 members in the district. During the program period (fiscal year 2060/61 to fiscal year 2064/65) 2020 goats were distributed by which 1441 male/female kids were produced and 587 were dead till the fiscal year 2064/65. Farmers had sold 398 goats and they had 1860 does) returned. Out of 2020 goats distributed 614 goats (30.39%) were returned. Benefit cost ratio of the goat pass-on program, on an average was found to be 0.974 ranging from 0.698 to 1.377. Goats were distributed only to females among them 88.43% were Dalit, 9.04% were Janajati and 2.52% were others. The study revealed that average annual cash generation from the goat was found to increase from Rs. 728.97 per household before project to Rs. 1112.71 per household after the project. Average land for fodder/forage was 0.16 *ropani*/household, and increased to 0.21 ropani after the project. There were 3.66 fodder trees per household before and 5 after project. The average mortality rate of the goat was found 19.23%. The study has concluded that as the goat pass-on program is popular and contributing to income generation to the rural poor, technical backstopping and social mobilization is highly required for the sustainability of the program.

### **A study on fresh buffalo meat marketing in Kathmandu valley**

**Sangita Kaduwal**

Buffalo meat is important livestock product contributing to livestock GDP and shares about 65% of the total meat production in Nepal. The major problem in the meat industry is on the marketing aspect. The study was therefore conducted to explore the marketing system of fresh buffalo meat in Kathmandu valley in 2008. About 74.28% of wholesalers and 62.85% of the retailers had meat marketing as ancestral jobs. About 71.4% of wholesalers and 65.7% retailers reported to continue the business for life long. Their major source of income was reported to be meat marketing. Average of number buffalo slaughtered per day per slaughter in Kathmandu valley was 3.86 with average net production of 876.5 kg. Maximum slaughters was recorded in Kathmandu (7.2) followed by Lalitpur 92.6) and Bhaktapur (1.8). The purchase price, marketing cost and profit

margin per kg of fresh buffalo meat for retailers in Kathmandu valley, on an average, was estimated to be Rs. 115.00, Rs. 18.61 and Rs. 11.39, respectively, whereas, profit margin of wholesalers per buffalo was in the range from Rs. 2,000 to 4,000. About 82.85% of slaughter places had aluminum roofs, 86.67% of them were dirty (unmanaged wastages, blood scattered), 86.67% had poor drainage and 94.29% had poor water supply and only 66.66% of them had floors made up of concrete. None of the slaughterers and wholesalers was found to have inspected the animals by veterinarians. Almost all the slaughterers were unaware about the animal slaughter house and meat inspection act. But 80% of them reported that the act is necessary. Similarly, 77.14% of wholesalers and 74.28% of retailers had opinion that the act is necessary and should be implemented. Only 16% of the consumers were aware of the act. About 90% of the consumers preferred non – refrigerated fresh meat and 60% of them reported that the meat they bought is not hygienic. The major problems identified in the buffalo meat business were physical injury of animals; poor drainage, water supply and cold storage facilities; etc. To solve the problem of buffalo meat marketing, there should be immediate implementation of the animal slaughter house and meat inspection act and providing the infrastructure facilities, separate slaughtering places, scientific management of wastage, and production of more number of buffalo meats with country.

### **Ginger-based micro-enterprises promotion through cooperatives**

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This study was carried out in Dhungedadhi VDC of Pyuthan district to assess the existing situation of ginger production and processing, and find out the ways to promote micro-enterprises through institutional mechanism. The sample size included in this study was 55 ginger growing farmers of selected study area. The study area is found dry for ginger cultivation. At present, the ginger production is in preliminary stage and due to lack of entrepreneur approach farmer could not harvest reasonable prices. Use of local variety, improper planting and harvesting, lack of use fertilizer and rhizome rot are the major problems of production. Market is the major constraint in the development. The government has formulated different policies like agricultural perspective plan, horticulture master plan, forestry master plan and various five year periodic plans but none of these plans could address the promotion of ginger-based enterprise. Hence it is suggested that government should launch a concentrated intensive package program in the pocket areas to improve socio-economic status and livelihoods of the people of Dhungegadhi VDC of Pyuthan district through the promotion of ginger-based microenterprises.

## **A study on socio-economic development of rural people through agroforestry system in Rasuwa district**

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The field study was conducted during September 1 – 16, 2008 in Dhaibung village of Rasuwa district to assess the contribution of Nepal Agro-forestry foundation (NAF) support programme to uplift the economic status of rural people through agroforestry system. The major finding of the study revealed that the fodder trees promotion program of NAF has played a significant role in the increase of the level of income of farmers in the project site, and that has positive relationship with livestock holding size. The growing of fodder trees on farm has direct impact on the condition of forest nearby the village. The forest in the nearby project village is in better condition than that of forest nearby control village. It is because of the fact that control village had to depend on forest fodder (40%) as compared to project village (6%). A dominant proportion (59%) of fodder in project village was supplied through farm fodder tree source. Net annual income of an average household in project village and control village was Rs. 34,891 and Rs. 711, respectively. From this study, it can be summarized that agroforestry plays a major role in uplifting the economic status of rural people. Study revealed that markets are easily accessible from the village that has a better transportation facility. A product produced by the farmers are disseminated to the consumers through different channels but mainly through market cooperatives in local village market where the products are deposited and finally marketed to different places. NAF extension process showed that the promotion of agroforestry program through home nursery approach was more effective than through community nursery approach where farmers groups play a vital role in the success of program. The study showed that the different training obtained by the farmers in project village though NAF were important for building their self-reliance in fodder production.

## **Economic analysis of *Allo* enterprise with respect to women empowerment in Pyuthan district**

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The study was carried out in Syauliband VDC of Pyuthan district aiming at finding out the implication of *Allo* enterprise in bringing socio-economic empowerment of the females involved in the enterprise and identifying the constraints of enterprise development. The study had emphasized the Micro-enterprise Development Project (MEDEP) trained women as well as the women who used their traditional knowledge and skills for the processing of *Allo* and production of *Allo* thread. The study was conducted during the month of October – November, 2008 using the descriptive and analytical

research design employing simple random sampling in selected 70 entrepreneurs from the different wards of the VDC. Dominated by the Magar population and with the livelihood still primitive, *Allo* enterprise is the traditional skill of the women population of the village. The women were found able to generate their own income, which was helpful for their day to day expenses. The average annual income was Rs. 3,468.57. The enterprise seemed to be in profit if the family labor was not incorporated in the economic analysis showing B/C ration of 4.5, whereas along with the imputed value of family labor and with the opportunity cost of the family labor, the enterprise was found to be in loss i.e. the B/C ratio of just 0.78. The enterprise has not been able to be established in a commercial mode for generating enough income due to lack of technology, lack of diversified products, appropriate training, tough land topography and difficult transportation system. At present, the labor required for the enterprise is higher than the return obtained i.e. the family labor cost for preparing 1 kg of normal *Allo* worth Rs. 350 per kg was Rs. 360. In context of place like Syaulibang, proper cultivation, harvesting, processing and manufacturing as per the requirement and working together in a group can empower women of the enterprise in the future days, so that gender issues and issues related to decision making and benefit sharing can be addressed through the *Allo* enterprise having higher potentiality and higher international demand.

### **An assessment of institutional setup of market centres in Kathmandu district and their strengthening possibilities**

**Prasanna Pradhan**

Agriculture is the backbone of the Nepalese economy. For the proper transportation of the agricultural products to the consumer level, the market centre has the important role including the marketing functions like assembling, concentration and diversion. The market centre equally promotes the trade and export business thereby increasing the economy as well as employment in the country. Due to the market centres, the consumers can get the commodities which are unavailable in the particular area even in the off-season. It also fixes the market prices of agro-products which help the consumer to purchase the products proper prices. Though there are many market centres established in the major pocket areas of the country, it has not yet utilized its human resources efficiently. Though the policies are formulated giving the priority to the deprived groups as Dalit, and women; it is not being implemented upto the targeted situation. The transaction of the sound market centres like Kalimati and Kuleshwor market centre is strong due to their efforts in selling their products like the practices of storage, processing, buying, selling grading, weighing, standardization, etc. These roles of markets are divided among the different sections of officers for the proper functioning of the market like administrative, financial, law and planning and monitoring sections. There are both strengths as well as weaknesses in the management and running of privately and board managed market centres which are part from each other and resembles in some cases. On the whole, we studied the institutional arrangements of the two market centres in Kathmandu district and concluded that there are many strengths

and weaknesses with their strengthening possibilities which will improve the present weaknesses prevailing in the respective market centres.

### **A study on business scope of rainbow trout farming in Nuwakot district**

**Jabin Shrestha**

Among the agricultural sectors, the fish industry is the important one that has the great potential to uplift the economic status of the country. The study was concentrated on the fisheries, particularly on an exotic cold water fish i.e. rainbow trout (*Onchorhynchus mykiss*) in Nuwakot district. The study was focused in Belkot, Madanpur, Kakani and Okharpauwa VDCs of Nuwakot district including Jitpur of Kathmandu valley. The star hotels/supermarkets/valley cold store of Kathmandu valley involved in the trout business as mentioned by the trout growing farmers were also surveyed. Rainbow trout farming is economically sound and highly profitable business which was clearly revealed by the B/C ratios 1.47 and 1.57 of the trout farms of the big and the small farmers, respectively. As a result, the number of trout farmers had increased to 22 in 2065 B.S. from only 1 in 2054 B.S. Although there is gradual increment in the number of trout farmers, the present production scale was unable to meet the daily requirement. The reason behind this is the low scale of production of the trout in the country and the increasing popularity of the trout as highly nutritious, tasty and healthy diet. As the net profit level in the trout business was very high i.e. Rs. 247 to Rs. 270 per kg production, it can contribute to reduce the pressure of poverty and uplift the economic status of the country. For this, the government and the private sectors should leave no stone unturned to produce the trout in large scale to meet the national demand. There is no doubt that our country is gifted with the sites suitable for trout cultivation; and it may be achieved by providing the technical and the economic support to the farmers, exploration of the feasible sites, decrease in the feed cost, easy loan sanction with low interest rate etc.

### **A study on potentials and problems of marketing of micro-enterprise products and services in Banke district**

**Asha Sharma**

The study was carried out in Banke district in September 2008, with the objective to find out the potentials and problems of marketing of micro-enterprise products and services for the sustainable development of micro-enterprises at micro level selecting MEDEP supported district –Banke- and employing stratified random sampling method in selecting 85 entrepreneurs of different strata which cover seven percent of the whole entrepreneurs. The study focused on the descriptive and analytical research designs. The key source of income and livelihood in the study area was agriculture. Along with this, farmers have been adopting micro-enterprises based on local resources. Since last decade, farmers have

been receiving supports from MEDEP with the objective that they could increase their living standards along with imparting level of participation of the poor strata of the society. The purposes of establishing micro enterprise were different, majority of causes were economic self-dependency, inadequate farming land, unemployment, utilization of skills and time. Most of the entrepreneurs could not focus marketing components such as identifying buyers, their needs, taste and preference. Due to the lack of necessary information about their customer capacity and willingness to pay for information gap, most of the entrepreneurs were congested within the district. The production level of the product was almost low. The marketing problems experienced by the entrepreneurs mostly were related to low volume of sales, dominance of local product, competition with other large industrial products, seasonal fluctuation, pressure of credit sales, difficulty in locating a suitable market place. Due to the lack of their own brand name they also faced some difficulties in the markets. They also had some problems to bring raw materials from outside the district. The concept of advertisement (promotion of products and services) was not introduced in the study area. The enterprises were based on “supply creates its own demand” concept. The study revealed that there is positive change in the life of entrepreneurs after involving the micro-enterprises development program. By the intervention of MEDEP, the entrepreneurs were able to generate their own income, which has been helpful for their day to day expenses. The trends of involving into direct income generating activities like micro-business are increasing significantly within marginalized and ethnic groups.

### **Farmers motivation in feed and forage selection in Palpa**

**Mahendra P Bhandari**

A field investigation was conducted in 2008 from August to November in Masyam, Pipaldanda and Bhairavsthan VDCs of Palpa district of Nepal to analyze the perceptions of farmers toward feed and forage selection and to understand the motives underlying the farmers' attitude toward new technology adoption. Field level simple random sample survey in 30 households was conducted and focus group discussion (FGD) was organized in Masyam, Pipaldanda, and Bhairavsthan VDCs. The household survey revealed that the family size of the respondents was sufficient for livestock rearing, however the active participation for livestock rearing was found to be primarily contributed by the elder members of the family. The feed and fodder supplied by the farmers to the livestock was varied from individual to individual. They provided feed in different stages of the animal like pregnant, lactating and drought but they neglected to feed the livestock in sufficient amount in dry stages. The farmers believe that the supplement improved feed, and forages contributed to increase about 1–2 litres milk production per day per animal in case of cattle and buffalo, and total weight gain in case of goat was also increased 2 -3 kg per year. It was found that community livestock development project (CLDP) is aiming to increase livestock productivity. Educated manpower was also motivated and involved in livestock rearing process due to limited employment opportunity in other sectors as well as the incentive provided by CLDP that contributed in higher production from the



livestock sector as compared to indigenous livestock rearing practices. Concerning land owned by the farmers, availability of the feed and forage was found to be less because only 33% of the respondents had their own land to produce feed and forage. Similarly, improved forage and fodder preference by the farmers was found to be contributed by the high production, taste of fodder and forages, less labor and less time requirement to harvest, possibility of multiple harvesting, availability in offseason and the total weight of the forage grown by the farmers.

### **A study on marketing of the tomato in Kavre**

**Dinesh Gelal**

The research was conducted during the period from August to November 2008 in Banepa vegetable collection centre, Tamaghat vegetable collection center, and Tinpihle vegetable collection centre of Kavrepalanchwok district. Farmer from different VDCs Nala, Rabiopi, Anakot, Panchkhal, Patleket, Bhakundebesi, Devbhumi Baluwa etc. brought tomato in these collection centres of Kavre district. The main objective of the study was to assess the marketing situation of tomato in Kavre. The tomato production started at the study area for 20 years, and now it is growing at commercial scale. The study area was one of the pocket areas of tomato production. Most of the producers, traders and retailers involved in the tomato marketing were of all age and most of them were literate. Above 67 percent of producers was cultivating tomato for the last 10 years. More than 50 percent traders and 50 percent retailers sold 400 kg of tomato daily. Tomato had good marketing in local market as well as they were able to supply surplus tomato to big cities of Nepal like Pokhara, Hetauda, Birgunj, Narayanghat, and sometimes to Biratnagar during off-season period. These were the good sign for development of the tomato marketing in Kavre. The cost of the production of "Anita" variety of tomato from one ropani land was Rs. 8928 including fixed and variable costs. The market price was Rs 22 per kg. The total production of tomato from 1 ropani land was thus Rs. 23,100. The gross profit for the farmer was Rs. 12,172 per *ropani*. The cost of same tomato to traders and retailers were R. 26,250 and Rs. 31,500, respectively including marketing, packaging and grading price. It showed that when price went high farmer were benefited, and when the price of tomato were low farmers were badly affected. Traders were found able to expand their market outside the valley. They were supplying tomato to other cities like Pokhara, Narayanghat, Hetauda, and Birgunj.

## 6 Veterinary Science

### **Production of hyper immune serum against peste des petits ruminants and comparison of its antibody titre**

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Six sheep, four goats and six rabbits were selected for the production of hyper immune serum against Peste Des Petits Ruminants (PPR). These animals were divided into three groups as control, adjuvant and plain antigen group. SIGMA, Freud's Complete Adjuvant and the PPR virus antigen was used for hyper immune serum production. Sheep and goats were injected at the rate of  $5 \times 10^4$  and rabbits at the rate  $2.5 \times 10^4$  TCID<sub>50</sub> of PPR virus by intramuscular route, and no inoculation was done to the control group. Prior to each inoculation sheep, goat and rabbits were bled and serum was harvested and subjected to competitive Enzyme Linked Immunosorbent Assay (cELISA) for antibody titer determination. After primary inoculation three boosters of same antigen was used. Plain antigen was injected in weekly interval through subcutaneous route while adjuvant mixed antigen was inoculated after 14 days interval through subcutaneous route. Hyper immune serum was harvested a week after the final booster. In adjuvant group, the antibody titer in sheep, goats and rabbits were as 84.75 %, 82 % and 74.5 %, respectively. In plain antigen group, the antibody titer in sheep, goat and rabbits were as 68 %, 87 % and 87 % respectively. In adjuvant group, higher antibody titer was produced in sheep followed by goats and rabbits whereas in plain antigen group higher antibody titer was produced in goats followed by rabbits and sheep.

### **Prevalence of FMD and its serotypes in Nepal**

**Hari P Suwal**

A total of 44 samples from the various livestock species were collected from the recent outbreak districts. The collected samples were from the districts: Jhapa, Lalitpur, Dolakha, Kathmandu, Nuwakot, Bardiya, Tanahu, Banke, Dailekh, Darchula and Achham. Out of them, 12 were found to be positive for Foot and Mouth Disease representing of 58% (7) of O serotypes, 25% (3) of Asia 1 and 17% (2) of A serotype. Secondary data were collected from Veterinary Epidemiology Centre and National FMD and TADs Laboratory, Kathmandu for the analysis. In the interval of 2001 to June 2006, an analysis was made for the serotypes, seasonal occurrence, and ecological distribution of the disease. From the analysis it was found that 71% of O strain was followed by 15% of Asia 1 and 14% of A serotype. In that period, the maximum numbers of the outbreak cases were in the months of May, June and July. Although tests and slaughter method is the best method of disease control and eradication due to religious reason it has not yet

been applied. So, perfect quarantine measures, vaccination, and zonation could be best way of disease control and prevention.

### **Seroprevalence of caprine brucellosis in Chitlang**

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Out of a total of 98 serum samples collected randomly during July to August, 2006, from indigenous Khari, Jamunapari, Sannen and Barbari goats of Chitlang including those with a history of abortion and stillbirth. Five goats (5.10%) were found positive reactors for antibodies against *B. abortus* with Rose Bengal Plate Test and Card Test. All the positive five cases had a history of either abortion or stillbirth in the last trimester of the pregnancy. The percentage prevalence of brucellosis in Jamuanpari goat was found higher (8.1) as compared to Khari (4.41). Brucellosis was prevalent between the age group of 8 – 24 months. The percentage prevalence was found to be more in male (12.5%) as compared to female (4.41%). Considering the higher prevalence of the disease in the population studied suitable preventive and control measures including the adoption of test and slaughter of seropositive animals, effective quarantine and legislative measures and awareness programs for farmers, meat sellers, meat processors, veterinary technicians and stakeholders at all level have been recommended.

### **Study on the prevalence of coccidiosis in broiler farms in Kathmandu district**

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A study was conducted in 2006 to determine the general, age-wise and area-wise prevalence of coccidiosis in broiler farms of Futung, Macchegaun, Matatirtha and Kirtipur areas of Kathmandu district. The general prevalence of coccidiosis was 31.74%. The prevalence percentage in the age group 3 – 6 weeks was the highest (39.17%) followed by above 6 weeks (37.50%) and 0 to 3 weeks (15.71%). The chi-square test indicated that the difference in age-wise prevalence of coccidiosis will vary according to the age of the birds which was similar to the age-wise prevalence of coccidiosis. Similarly, the area-wise prevalence percentage was highest in Futung i.e. 38.33% and lowest in Kirtipur i.e. 22.0%. The area-wise prevalence percentage of Matatirth and Macchegaun were 37.14% and 26.0%, respectively. The chi-square test indicated that the difference in area-wise prevalence of coccidiosis was insignificant. This showed that in the same type of management condition, the chances of occurrence of coccidiosis will be similar in all the four different areas. However, the area-wise prevalence of coccidiosis varied in these areas. Also, the area-wise mortality percentage was highest in Futung i.e. 2.79% followed by 2.07% in Matatirth, 1.32% in Macchegaun and lowest in Kirtipur i.e.

1.12%. This finding coincides with the prevalence of coccidiosis in these areas. Similarly, the number of cases of coccidiosis in Central Veterinary Hospital, Tripureshwor has been decreased from fiscal year 2060/61. Thus it can be concluded that coccidiosis may occur at any age and area located in different geographical locations. It is largely related with the management conditions of the broiler farms; and the disease is most likely observed when broilers are concentrated under wet litter conditions that permit the accumulation and sporulation of large number of oocysts.

### **Prevalence of mites in case of dermatitis dogs in Kathmandu valley**

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A study was conducted at Central Veterinary Hospital, Tripureshwor, Kathmandu and various other private clinics from June to August 2006. Altogether 106 cases of suspected positive dogs usually harboring dermatitis and skin infection in Kathmandu valley were selected. The samples were collected for laboratory investigation to identify the mites as the causal agent among them. The result showed that out of 106, 54 samples were found positive giving the prevalence of 51%. Among different breeds, mongrel represented the highest prevalent of mite 56.25%, followed by pure (51.56%) and cross (46.15%). Among the mite isolated the prevalence of demodex (56%) was found to be more than the Sarcoptes species (44%). Sex-wise prevalence showed non-significant difference in the prevalence between male and female. And among three different age groups, 4 – 8 years were found to be affected more with 60.40%, followed by 0 – 4 years (44.89%) and lastly 8 – 12 years with 33.33%. Secondary data were collected from Oxford Veterinary Clinic, Baluwatar, Kathmandu for analysis. In the interval of 2061 Baisakh to 2063 Bhadra, analysis was made for breed-wise prevalence of the cases. From the analysis, it was found that pure breed was most affected than the other breeds giving the prevalence of 63% followed by mongrel (33%) and the cross (4%).

### **A comparison of microbial load in buffalo meat from improved and traditional meat shops in Kathmandu**

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A microbiological study was carried out in meat samples from various localities of Kathmandu metropolitan city during June to August 2006. Samples were collected from traditional and improved retail meat shops in the early morning. The microbiological study for TVC count 6.85 to 6.99 (in log value) with mean of 6.93, *E. coli* count 6.56 to 6.93 (in log value) mean of 6.45 and *Salmonella* count 5.60 to 6.32 (in log value) with mean of 5.93 were found in traditional retail meat shops, respectively. Similarly, the TVC count 5.92 to 6.08 (in log value) with mean of 6.00, *E. coli* count 5.63 to 5.83 (in log

value) with mean of 5.75 and *Salmonella* 5.23 to 5.53 (in log value) with mean of 5.38 were found in improved retail meat shop. The organism *E. coli* and *Salmonella* were isolated with their colony characteristics. Highly significant difference ( $p < 0.01$ ) was noticed in TVC between traditional and improved retail meat shop. The estimation of *E. coli* and *Salmonella* revealed highly significant ( $p < 0.01$ ) difference between traditional and improved retail meat shops. The result obtained in this study revealed that improved retail meat shop decreased the microbial load and increased meat quality in marketed retail outlet of meat shop. The prevalence of coliform is slightly higher than *Salmonella*. However, both bacteria are considered to be pathogenic and have public health importance.

### **Epidemiology of fasciolosis in stall fed bovines at low altitude villages of Dhading district**

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This study was conducted during May to August 2007. A total of 243 fecal samples collected randomly from bovines of four VDCs of Dhading district showed prevalence of 42.5% and 29.3% liver fluke infection during spring and late monsoon, respectively. Slaughter place survey carried out during September showed 43% buffaloes infected with *Fasciola gigantica* with recovery of 59 to 212 flukes, among which 83% were adults and 17% immature. In the treatment response study, 17 cattle were drenched with triclabendazole at the dose rate of 12 mg/kg body weight, and 16 buffaloes and 13 cattle with oxcylozanide at the dose rate of 13 mg/kg body weight during March. In triclabendazole treated cattle, there was no reappearance of fluke eggs till 116 days post treatment while 16.6% and 27.2% of cattle started re-shedding *Fasciola* eggs after 150 and 173 days post drenching, respectively. This indicated that the animals were again exposed to the infection after drenching since triclabendazole kills most immature and all adult flukes. In oxcylozanide treated group, 7.1%, 14.8%, 27.2% and 35% of animals started re-shedding *Fasciola* eggs after 81, 116, 150 and 173 days post treatment, respectively. As oxcylozanide is effective only against mature flukes over twelve weeks of age, the findings of this experiment indicated that there was regular development of immature flukes remaining in the animals after oxcylozanide treatment and the animals started to show fluke eggs after 81 days post treatment. The response effect of these drugs indicated that the animals harbored both immature and mature flukes. Moreover, the animals were again exposed to infection. This result is further supported by survey work which revealed that poor exposure to sunlight and rice-straw feeding round the year, and feeding of forages from the marshy areas were the possible sources of *Fasciola* infection to the stall fed bovines. The magnitude and significance of *Fasciola* infection in Nepalese farm animals was illustrated by survey work that about 100 million rupees is being spent annually on flukicides which comprises of 65% of total veterinary drug sales in the country.

## **Prevalence of helminth parasites in wild water buffalo (*Bubalus bubalis arnee*) and wild spotted deer (*Axis axis*) in Nepal**

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A study was conducted during May to September 2007 to screen the helminth parasites of wild water buffalo (*Bubalus bubalis arnee*) at Koshi Tappu Wildlife Reserve (KTWR) and wild spotted deer (*Axis axis*) at Bardia National Park. Both reserve and park are bordered by a buffer zone, populated by human and livestock. The border of the reserve, park and the buffer zone has become a common place of interactions between the wild animals and farm livestock leading to high possibility of transmission of disease including parasites. Altogether fifty fresh fecal samples each of wild water buffalo and wild spotted deer were collected randomly during the study. Sedimentation and floatation methods were used to identify the helminth parasites. Wide range and in most cases mixed infection of parasites were found in these animals. Out of fifty fecal samples, all samples were positive for parasites in wild water buffalo and 36 were positive and 14 were negative in wild spotted deer. Among the positive samples, 75%, 14% were single type and 25%, 86% were mixed type infection in wild spotted deer and wild water buffalo, respectively. Strongyles (30% and 4%), Paramphistomes (26% and 90%) and Fasciola (24% and 84%), were most commonly prevalent parasites infecting wild spotted deer and wild water buffalo, respectively. Better management practices can be developed to limit parasitic problem, transmission, and improve the people's relationship with the wildlife.

## **Screening of mange infestation in domesticated and street dogs of Kathmandu valley**

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A study on mange in street and domesticated dogs of Kathmandu valley was conducted from June to September 2007. A total of 70 skin scrapings were taken from the dogs having skin problems. Out of 70 samples collected and examined, 35 were from central veterinary hospital (CVH), Tripureshwor and rest 35 were from Kathmandu Animal Treatment (KAT) centre, Chapligaon. In CVH, majority of the domesticated dogs were brought from different places of the valley for treatment where as in KAT centre, street dogs were brought from different areas of city for "Animal Birth Control (ABC)" program. The results showed 46% and 60% samples positive for mites in domesticated and street dogs, respectively that implied the incidence of mite was higher in street dogs. Out of the total positive samples, 69% were *Demodex spp.* and 31% *Sarcoptes spp.* from the scrapings examined from domesticated dogs at CVH. Likewise 62% were *Demodex spp.* and 38% *Sarcoptes spp.* from the positive samples examined from street dogs at

KAT centre. On treatment response study, significant improvement was observed on external examination of body condition after weekly treatment of Ivermectin along with application of "Amित्र" and skin conditioner.

### **Prevalence of subclinical mastitis in cattle in Panauti municipality**

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A study was conducted from June – August 2007 in Bhandarigaun area of Panauti municipality. A total of 200 samples from 50 cattle were collected to know the prevalence of the sub-clinical mastitis. Tests for mastitis were carried out in veterinary teaching hospital, HICAST, Gaththagar, Bhaktapur. Altogether three different tests were employed to detect the mastitis which were respectively CMT, Mastrip paper test and pH detection test. The CMT positive samples were further subjected to bacteriological assay by cultural examination. Out of 200 samples, 32 (16%) samples were found to be sub – clinical mastitis (SCM) positive, whereas out of 50 cattle, 22 (44%) cattle were found to be positive for SCM. Among them 29 samples were positive for California Mastitis test, 24 samples were positive for Mastrip paper test and 9 samples had elevated pH. Out of 29 CMT positive samples all grew in nutrient agar and among them 12 were gram negative and 17 were found to be gram positive. Along with the laboratory studies, epidemiological questionnaire survey was also performed in the study area. The survey revealed that the cattle population of the study area had nearly equal populations of indigenous (42%) and exotic (58%) breed, and the disease was found more among the exotic high producer breeds. The animals between the 3<sup>rd</sup> to 6<sup>th</sup> parity were found to be more infected by the disease.

### **Assessment of bacteriological standards of poultry carcass from slaughter slabs of Kathmandu valley**

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A total of 21 chicken meat samples were collected from seven different slaughter slabs of Kathmandu Valley during July-August 2007 to assess the bacteriological quality. Test for total viable count (TVC), coliform and Salmonella were carried out using methodology as prescribed by ISO, in Microbiology Laboratory, HICAST, Gaththagar, Bhaktapur. Coliforms and Salmonella were identified on the basis of their colony characteristics in selective media. Average values of TVC and coliform count were found to be  $5.40 \pm 0.12$  and  $2.80 \pm 0.05 \log_{10}$  cfu/gm respectively. Two samples of two different slaughter slabs were found to be positive for Salmonella. Epidemiological questionnaire survey was also conducted to understand the hygienic standard of the slaughter slabs. The survey revealed that only few slaughter slabs maintained proper plant sanitation

while others neglected the basic standards for the production of quality meat. The average value of TVC and coliforms were slightly higher than the international standard. However, Salmonella (9.52%) in the meat samples indicates that the hygienic standards have to be maintained in Nepalese slaughter slabs. Similarly a more extensive research on microbiological quality of chicken meat is essential in Kathmandu valley.

### **Serological screening of bovine tuberculosis in buffaloes brought for slaughter in Kathmandu**

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A study was conducted to determine the prevalence of bovine tuberculosis in buffaloes brought for slaughter in Kathmandu. A total of 50 pooled serum samples were subjected to the test using Anigen Rapid Bovine Tuberculosis Antibody Test Kit. Out of the 50 pooled serum samples, 14 samples showed positive reaction with a prevalence of 28 percent.

### **Assessment of microbial quality of poultry carcass sold in Rupandehi district**

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Rupandehi district is potential meat pocket area. Questionnaire survey was carried out individually with the butcher and owners of slaughter slabs. A microbiological study was carried out in meat samples collected from various localities of Rupandehi district. The samples were collected from traditional and improved retail meat shops at early morning. The microbiological study for TVC count  $1 \times 10^5$  to  $5 \times 10^5$ , E. coli count  $5 \times 10^2$  to  $8 \times 10^2$  and one positive sample for Salmonella were found in selected part of Bhairahawa municipality. Similarly, the TVC count  $1 \times 10^5$  to  $4 \times 10^5$ , E. coli count  $4 \times 10^2$  to  $7 \times 10^2$  and one positive sample for Salmonella were found in selected part of Butwal municipality. TVC count 5.20 to 5.55 (in log value) with mean of 5.37, E. coli count 2.72 to 2.86 (in log value) with mean of 2.48 was found. The organism E. coli and Salmonella were identified with their colony characteristics. There was highly significant difference ( $P < 0.01$ ) in TVC between traditional and improved meat stall of Bhairahawa and Butwal. The results obtained in this study revealed that improved meat stall decreased the microbial load and increased the meat quality in marketed retail outlet. The prevalence of Coliform was higher than salmonella.



## **Screening of antibiotics residues in milk samples of Kathmandu valley**

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A study was conducted to screen the antibiotics residue in milk of Kathmandu valley. Semi-quantitative rapid residue test as per the protocol of Rodejanarug Pharmaceutical, Thailand was performed to determine the level of commonly used antibiotics, penicillin and sulphonamide in 75 raw and pasteurized milk of Kathmandu valley. Fifty raw milk samples from the households and 25 from different dairies of Kathmandu valley were collected and brought to Veterinary Standards and Drug Administration Office, Tripureshwor for the test of residues of penicillin and sulphonamide. The test showed that out of 75 samples, eight (10.66%, 95% CI: 10.09% - 35.05%) was found to be positive for antibiotics. Out of eight positive samples, six (8%) were positive for penicillin, two (2.66%) were positive for unidentified group of antibiotics and no positive residues of sulphonamide was seen. The test revealed that penicillin ( $p = 0.05$ ) was significantly high in milk than sulphonamide. Out of 50 samples taken from different households, seven were positive and out of 25 samples from dairies, one was found positive.

## **Assessment of productive and reproductive performance of Murrah buffalo for selecting bull mother in Dhanusha district**

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A study was conducted from August 2008 to February 2009 in three VDCs namely Kurtha, Snurjora and Laxmipur Bagewa of Dhanusha district. Questionnaires were asked to 107 farmers who were raising different genotypes of Murrah buffaloes (50 – 62.5%, 62.5 – 75%, 75 – 87.5% and >87.5% with genotypes) 1, 2, 3 and 4, respectively. The data were collected for age at first heat (AFH), age at first service (AFS), age at first calving (AFC), calving interval (CI) for reproductive traits and daily milk yield, lactation length for productive traits. The buffaloes were selected on their individual performance and pedigree record. Buffaloes whose production levels were >8 l per day in 1<sup>st</sup> 3 months of the lactations were selected and the number of selected animals was 107. The least square means of AFH of genotype 1, 2, 3, and 4 ranged from 30.5 to 37.0 and comparing at ( $P < 0.001$ ) the genotypes, genotype 4 was the best. Similarly it was the best in AFS and AFC. In the comparison of reproductive trait with respect to genotype there were found significant differences ( $P < 0.001$ ) in both cases, and genotype 4 was again found to be the best. The reproductive traits of AFH, AFS and AFC were not significantly different ( $P > 0.001$ ) with respect to location. However, CI was significantly different ( $P > 0.01$ ) with respect to location (values was 12.0 to 16.07 months) as the blood level increased its AFH, AFS and AFC were decreased on the contrary. The lower blood level of Murrah buffalo showed AFH at latter age. The average of the total milk yield of different

genotypes of Murrah buffaloes from Ashad to Poush ranged from 7.35 to 8.61 l having the significant difference ( $P>0.001$ ) in genotypes 1 and 3. This adds the merits on genotype 3 for their selection according their performance efficacy. Similarly the variation also existed in the total milk yield with respect to locations that ranged from 5.89 to 7.41 l having the significant difference ( $P>0.001$ ). Findings have provided information in terms of the genotype, location, month, average means of AFH, AFS, AFC and CI with respect to genotype and location, which showed the variation, exists in the blood level and the location. However, productive and reproductive traits under study except CI were not significantly different with respect to location.

### **Seroprevalence of bluetongue in some of the sheep flocks in Dang, Lamjung, and Nawalparasi Districts**

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A study on seroprevalance of bluetongue in sheep was conducted during August to December 2008. A total of 83 serum samples were collected from some of the sheep flocks of Dang, Lamjung and Nawalparasi districts. The serum samples were tested for bluetongue virus antibody in sheep using cELISA at the National FMD and TADs Laboratory, Budhanilkantha, Kathmandu. Out of 83 samples examined, 10 samples (12.04%) were found to be positive for antibody to bluetongue virus. The antibody for BTV in sheep was found to be 20% in Dang, 8.92% in Lamjung and 14.2% in Nawalparasi districts. About 8.92% samples from migratory flocks and 18.51% samples from semi-sedentary sheep flocks were positive for antibody to BTV. As bluetongue is considered to be a major TAD, there is need to carry out clinical surveillance of bluetongue in sheep and sero-prevalence studies in other susceptible ruminants, and also extends its efforts on strategic control of bluetongue disease in the country. The epidemiology and sero-prevalence of bluetongue in national herd has not been sufficiently evaluated in the country, and the government has not yet formulated the national strategy for bluetongue control. Awareness among the sheep farmers regarding bluetongue disease and its control measures has to be created.

### **Prevalence of brucellosis in buffaloes at different site of Bhaktapur district**

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A study was conducted to determine the prevalence of Brucellosis in Buffaloes of six VDCs (namely Balkot, Sanothimi, Chaling, Chitpol, Bageshwori and Jhaukhel) of Bhaktapur district. Altogether 60 milk samples (10 from each VDC) were collected from co-operative society of Kharipati and Sallaghari. On milk ring test, out of 60 samples, 14

samples (23.33%) showed positive for milk ring test and the percentage of prevalence ranged from 13.75 to 36.30 at 95% confidence interval. Out of 60 serum samples collected from same buffaloes by tracing back to the respective herd, nine samples (15%) showed positive for *Brucella* by Rose Bengal Plate test i.e., the percentage of prevalence ranges from 7.5 to 27.08 at 95% confidence interval. Out of positive animals, only seven animals had a history of abortion and still birth in the last trimester of pregnancy.

### **Effect of total enzymes in the performance of broilers**

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This study was conducted from August 31 to October 25, 2008 at R. R. farm, Bhaktapur to study the effect of total enzymes in the performance of broilers, feed conversion ration, mortality pattern and economy. For this 650, day old commercial cob-100 broilers chicks were randomly divided into two treatments groups viz. feed with total enzymes (treatment group) and feed without total enzymes (control group); each group consisting of four replications and each replication having 81 chicks. The birds were fed *ad libitum* with B<sub>0</sub> ration upto 21 days of age, B<sub>1</sub> ration up to 35 days of age and B<sub>2</sub> ration then afterwards. Medication was done via drinking water as per their recommended dose. Vaccination was done to all the groups with F<sub>1</sub> on day 7, Leechi on day 10, IBD intermediate on day 13, IBD intermediate plus on day 19 and Lasato on day 26 through intraocular route whereas Leechi by subcutaneous route. Daily feed intake, mortality rate and weekly body weight gain was recorded. In 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> weeks their insignificant changes in body weight was found. In 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> weeks significant changes in body weight was found. Body weight was higher in treatment (2.8 kg) than those of the control group (2.4 kg). This result showed that feed with total enzymes have positive effect on body weight.

### **Impact of selective breeding in Khari goat**

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The study was carried out at Khanikhola 2 and 3 of Anbukhaireni VDC of Tanahun District in association with the ARS (Goat) Bandipur and Animal Breeding Division NARC, Khumaltar from August to December 2008. In total, 33 households were surveyed to get information about goat farming on farmers' condition. During field visit 212 goats of different age and sex were found. The average herd size was 6.4. On farmers' condition twinning of kids was found to be 72.6% against the single 26.4%. Population of Kali (Black) and Khairi (Brown) goats were found more of 32.1% and 27.8% respectively than any other available color pattern. Mean live weight and standard deviation of the first parity dam was 21.8±2.458 kg whereas for the 6<sup>th</sup> parity was

43.4±6.875 kg. Parity of does found in the survey ranged from 1 to 14. From 8<sup>th</sup> parity number of does kept by farmers was nominal (n=2). For this study, two selected bucks were used. Selection of buck was done on the basis of multiple birth case, having twinning history of both parents, weight gain trait at birth, weaning (four months) and six months age. From 100 does 168 kids were born. Among them 39 were single birth, 115 twins and 14 were triplets. The single birth case was 23.2% while the case of multiple births was 76.8%. The sex ratio was 91:77 male to female. Overall mean live weight gain and standard deviation at birth, wean and six months was 1.863±0.300, 9,170±1.676 and 12.230±2.077 kg, respectively. There was significant difference ( $P<0.001$ ) in weight gain trait at birth and wean by type of birth (single and multiple) of kids. Similarly there was significant difference on weight gain trait at six-month weight by sex of the kid ( $P<0.001$ ).

### **Prevalence of Fasciolosis in goat at Jhore and Thankot of Kathmandu district**

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A study on the prevalence of fasciolosis in goat was conducted at Thankot and Jhore of Kathmandu district, the program sites of Heifer International through “women for women’s forum” during July to December 2008. A total of 230 samples were collected and examined by employing sedimentation method. The overall prevalence of fasciolosis was found 23 (10%) out of 230 samples examined. Significant difference was found in the prevalence of fasciolosis among goats of both sites. The prevalence of fasciola infestation in goats was 7 (5.60%) of Thankot from where 125 samples were examined. Similarly in goats of Jhore (from where 105 samples were examined) 16 (15.23%) goats showed positive response. The study was also conducted on the basis of age and sex wise prevalence of fasciolosis in goats. Out of 27 samples examined of male goats from Thankot, only 1 (3.70%) showed positive response and out of 98 samples of female goats 6 (6.12%) were found to be positive. Likewise on the basis of age wise prevalence, out of 29 samples of 3 – 6 months age group of goats from Thankot, only 1 (3.44%) showed positive. Similarly 4 (6.77%) out of 59 samples of 6 - 12 months age group of goats were positive. Out of 23 samples of 3 – 6 months age group of goats collected from Jhore 2 goats (8.69%) were found to be positive. Similarly 11 (20.75%) out of 53 of 6 – 12 months age group of goats, and 3 (10.34%) out of 29 samples were found to be positive for above 12 months of age group of goats, respectively.

## **Prevalence of subclinical mastitis in cattle of Balkot and Sanothimi area**

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A study was carried out on a total of 50 lactating cows for sub – clinical mastitis by using CMT, pH test, Mastrip paper test and antibiotic sensitivity test. Of all the animals tested 24 (48%) were found positive for mastitis. On Mastrip paper test 37 samples (18.5%) were positive whereas test using pH paper showed that only 9 (4.5%) samples had elevated pH (>6.8). Out of 39 CMT positive animals, all were bacteriologically positive in nutrient agar whereas 11 (28%) were positive in Max Conkey agar. The prevalence of sub clinical mastitis was found to be 48% in cattle and 21% in quarter basis. Bacteria belonging to coliform, streptococci and staphylococci genera were isolated in 28.2%, 48% and 23% samples, respectively. The organisms were found most sensitive to Enrofloxacin (92.3%), followed by Gentamian (74.35%) and Oxytetracycline (41.02%).

## **Immunomodulatory effect of stinging nettle (*Urtica dioica*) in poultry**

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The immunomodulatory effect of stinging nettle in poultry was studied. A total of 50 birds were divided into two groups (Treatment and Control), each consisting of 25 birds. Treatment group was fed with 1% of nettle powder mixed with commercial broiler feed on Sunday, Tuesday and Thursday up to third week whereas control group received only commercial broiler feed. After three weeks of feeding 1% nettle, level of nettle was increased to 3% and nettle powder mixed with commercial broiler feed was given to treatment group weekly once in every Sunday until the end of trial whereas control group received only commercial broiler feed. All birds were vaccinated against Newcastle disease (ND) and Infectious Bursal Disease (IBD) with ND vaccine (F1 strain) on Day seven and IBD vaccine (Intermediate strain) on day 14, respectively by intraocular route. Growth performances of the chick and antibody titre against ND were evaluated. Body weight of individual birds of both groups was recorded weekly. Sera were collected at the end of 5<sup>th</sup> and 7<sup>th</sup> weeks of trial. The haemagglutination (HA) and haemagglutination inhibition (HI) tests were carried out for ND. Due to litchi outbreak and high level of aflatoxin in feed, mortality recorded was nearly 50%. A protective level of antibodies was maintained in treatment group whereas control group showed low level of antibody titre. Although positive effect on growth performance was not evident in this experiment, this study indicated that nettle supplementation helps to improve immune status.

## **Prevalence of bovine tuberculosis in Rupandehi district**

**Sita Acharya**

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Rupandehi district is potential dairy pocket area. Almost all the cattle rearing in this area are for milk production. The main objective of this study was to minimize the economic losses which are incurred by the dairy farmers through bovine tuberculosis, and similarly improvement of the quality of the milk and milk products which are being consumed by the valued customers. Questionnaire survey was carried out with individual home visit, the animals showing symptom of progressive emaciation, capricious appetite and fluctuating temperature were tested. Similarly, symptom of dyspnoea, noisy breathing and infertility were also considered. Tuberculin test among the selected cattle was conducted using single intra-dermal test (SIDT). Two (5%) out of 40 cattle were found positive to tuberculin test. The result obtained in this study revealed that there is presence of tuberculous animal in Nepal. Nepalese farmer continue to keep disease affected animal such as tuberculosis. The prevalence of the tuberculosis is higher in old age cattle.

## **Screening of antibiotic residue in poultry meat sold in Kathmandu valley**

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A study was conducted to screen the antibiotic residue in poultry meat of Kathmandu Valley. Altogether 75 meat samples were subjected to the semi-quantitative test using Rapid Residue Test Kit manufactured by Rodejanarug Pharmaceuticals, Thailand. Out of 75 meat samples tested 12 (16%) samples were positive for antibiotic residue. Forty-five samples were tested for Tetracycline residue, out of which 9 (20%; 95% CI: 10.09 – 35.05) samples were found positive and the level of residue varied from 0.2 mg/kg to 3.2 mg/kg. Among samples 0.2 mg/kg, 1.6 mg/kg and 3.2 mg/kg residues were obtained from 6 (13.33%), 1 (2.22%) and 2 (4.44%) samples, respectively. Similarly out of 30 samples tested for aminoglycosides, macrolids and suphonamides group, 3 (10%, 95% CI: 2.62 – 27.68) were positive and level of residue varied from 0.5 mg/kg to 1 mg/kg, which were obtained from 2 (6.66%) and 1 (3.33%) samples, respectively. The difference between the two groups of antibiotics was not statistically significant ( $p=0.247$ ).

## **Study on microbial quality of pasteurized milk from Kathmandu valley**

**Surendrya Kumar Basyal**  
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Access of safe and whole some food such as milk is prerequisite for health and well being of people. High microbial load associated with pathogenic organism in milk and milk products lowers their keeping quality and enhances the potential risk for milk borne diseases. Milk and milk products is the vehicle for food and water borne disease as well as the major source of zoonotic diseases. High microbial load in pasteurized milk may be indicators of possible post pasteurized contamination in milk. With a view to evaluate the microbial load in pasteurized milk, this study was carried out at Central Veterinary Laboratory (CVL) in Tripureshwor, Kathmandu, Nepal from August to September 2008. For the study purpose, 100 samples of pasteurized milk were collected from 10 different dairy industries of Kathmandu valley. The samples were analyzed for the enumeration of total viable cells and further test, pathogenic organism by colony character and microscopic examination. All the target pathogens under investigation were detected in pasteurized milk samples. Among them, *Staphylococcus* spp. (71), *Streptococcus* spp. (87) and Coliform (38) were found. *Staphylococcus* sp. *Streptococcus* sp. and Coliform were identified on the basis of their colony characteristics in nutrient media and staining method. The highest total viable count in pasteurized milk was found to be  $5.37 \log_{10}$  cfu/ml where the lowest total count recorded was  $3.95 \log_{10}$  cfu/ml, with mean of  $4.69 \log_{10}$ ,  $4.73 \log_{10}$ ,  $4.71 \log_{10}$ ,  $4.66 \log_{10}$ ,  $4.74 \log_{10}$ ,  $4.89 \log_{10}$ ,  $4.74 \log_{10}$ ,  $4.93 \log_{10}$ ,  $4.83 \log_{10}$ ,  $4.72 \log_{10}$  cfu/ml for A, B, C, D, E, F, G, H, I & J dairy, respectively.

## **Assessment on the bacteriological quality of fresh pork meat from the meat shops of Kathmandu valley**

**Parisha Thapa**

An assessment on the bacteriological quality of fresh pork meat shops of Kathmandu valley was done during August to December 2008. A total of 28 samples were collected from 7 different meat shops. Test for total viable count (TVC), Coliforms and Salmonella were carried out using methodology as prescribed by ISO, in Microbiology Laboratory of HICAST, Gatthaghar, Bhaktapur. Coliforms and Salmonella were identified on the basis of their colony characteristics in the selective media. Bacteriological examination of 28 fresh meat samples revealed average value of TVC and Coliform count  $5.42 \pm 0.11$  and  $2.8 \pm 0.06 \log_{10}$  cfu/g respectively. Two samples (9.52%) were found to be positive for Salmonella. The average value of TVC and Coliforms were slightly higher compared with the international standards set for the fresh meat. Epidemiological questionnaire

survey revealed that only few meat shops maintained proper plant sanitation while others neglected the basic standards for the production of safe meat. Thus, more extensive research on microbiological quality of meat is essential to identify the risk sources and to minimize the bacterial load in the meat sold in Kathmandu Valley.

### **Assessment on the bacteriological quality of fresh goat meat from the meat shops of Kathmandu valley**

**Suraj Thapa**

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A total of 27 goat meat samples were collected from nine different meat shops of Kathmandu valley during June to August 2008 to assess their bacteriological quality. Laboratory works were performed at Veterinary Teaching Hospital, HICAST, Gathghar, Bhaktapur. Average values of TVC and Coliform count were found to be 5.43 and 2.82 log cfu/g, respectively. The standard deviation of TVC was 0.069 and that of Coliform count was 0.033. Two samples from two different slaughter slabs were found positive for Salmonella. Coliforms and Salmonella were identified on the basis of their colony characteristics in their selective media. Epidemiological questionnaire survey was also conducted to understand the hygienic standard of the slaughter slabs. The survey revealed that only few meat shops maintained proper sanitization while others neglected the basic standards for the production of quality meat.

### **Prevalence of *Neoscaris vitulorum* in young calves of Morang district**

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A study entitled prevalence of *Neoscaris vitulorum* in the calves of Morang district was conducted from September to November 2008 in Morang district. A total of 120 samples (80 from buffalo calves and 40 from cattle calves) were collected to know the prevalence of *N. vitulorum*. Tests for prevalence were carried out in Regional Veterinary Laboratory, Biratnagar. Tests carried out for prevalence were fecal examination by floatation method and for quantitative method of infection egg per gram of feces was conducted. Out of 120 samples, 25 calves were positive for *Neoscaris* eggs, representing a prevalence of 20.83%. Out of 40 cattle calves, 10 (25%) were positive for *Neoscaris* eggs, and out of 80 buffalo calves 15 (18.75%) were positive for *Neoscaris* eggs. Eggs per gram of feces of calves were also counted and that ranged from 1,500 to 3,000. Eggs per gram of feces were high in 0 – 1 month old calves than in 1 – 2 or 2 – 3 months old calves. In non-drenched calves, prevalence was found to be high in comparison to drenched calves of that study area.



## **Prevalence of fasciolosis and efficacy of triclabendazole against fasciolosis in goats of Kathmandu and Bhaktapur districts**

**Mukesh Nayak**

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A study was performed to determine the prevalence of fasciolosis in goats in Heifer supported area of Kathmandu and Bhaktapur districts by faecal examination; and the efficacy of triclabendazole in the treatment of the infection was carried out. The study was carried out from October to December 2008. Out of total 250 samples, 56 (22.40%) samples were found to be negative. Seventy six samples of faeces of male goats were examined in the laboratory which showed that 16 (21.05%) out of 76 were positive. Similarly, out of 164 samples of faeces of female goats, 40 (24.39%) were positive. The breed – wise prevalence of fasciolosis in goat showed that 12 out of 72 were positive in Khari breed and 44 out of 178 were found positive for Jamunapri cross. Sixty one samples of 4 – 12 months aged goat faeces were examined in the laboratory in which 10 (26.39%) were found to be positive. Similarly, 31 (24.80%) out of 125 and 15 (23.44%) out of 64 samples were found to be positive for 12 – 24 and above 24 months aged goats, respectively. Out of 41 samples taken from stall fed goats, 4 (17.07%) were found positive and 49 (23.44%) out of 209 were found positive for grazed goats. The efficacy of triclabendazole for the treatment of fasciolosis was found to be 100%.

## **Retrospective study on the outbreak pattern of peste des petits ruminants (PPR) in Nepal**

**Narayan Prasad Ghimire**

The study was conducted in sheep and goat of Nepal during August to December 2008. To accomplish the study, records and data of the epidemiology department were analyzed. The result showed the highest prevalence of PPR in 2001 (210). The morbidity and mortality pattern showed highest outbreaks in 2001 (59,916), decreased in 2002 (11,158) and least number of cases was in 2004 (210). The morbidity and mortality pattern showed highest outbreaks in 2001, reduced progressively since 2002 to 2004 and again increased from 2005. Case fatality rate during 5-year period varied from 9% (2003) to 38% (2005) with an average of 22.85. The average number of outbreaks from 2001 to 2007 was 332.14 with high coefficient of variation (CV=101.61). Prevalence of PPR across the development regions showed highest outbreaks in central development region (1340) followed by eastern (317), mid-western (287), western (259) and far western (130). Occurrence of PPR was found to be common in the districts of terai region (1445) in last seven years followed by hill (680) and mountain (200). In month wise, outbreaks of PPR were found to be highest in humid and rainy season months of May, June and July. The second epidemic outbreak was seen in the month of September and October due to the rampant movement of the animal. In between caprine and ovine, higher

outbreak was observed in caprine with an average of 311.28 with high coefficient of variation (CV=94.79). The numbers of outbreaks in districts decreased from 2001 (54) to 2004 (9) but after 2005 it was in increasing order – in the year 2006 (30) and 2007 (15). Intensive sero monitoring, vaccination, strict quarantine measures, perfect awareness programme, media and stakeholders inclusion should be adopted for the control of the disease. Zonation of the country as highly vulnerable area, less vulnerable area and safe area and strategic regimes need to be designed accordingly.

### **A study on sub clinical mastitis in bovine population of Mulpani VDC, Kathmandu**

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This study was conducted from June to August 2008 at Mulpani VDC of Kathmandu district in an attempt to assess the occurrence of sub clinical mastitis in the bovine population of the area. Laboratory analysis was carried out at Himalayan College of Agricultural Sciences and Technology, Gathaghar, Bhaktapur. A total of 200 milk samples from 50 apparently healthy cattle were tested with Mastrip Test, California Mastitis Test (CMT), Modified Whiteside Test (MWT) and cultural examination. Overall, on the animal basis, 34%, 38%, 34% and 42% positive result was seen with the CMT, MWT, Mastrip Test and Cultural examination, respectively, whereas on the quarter basis, the positive results were 29.5%, 33.5%, and 38%, respectively in the same order. Among the drugs tested, Gentamicin was found most sensitive followed by Oxytetracycline and Penicillin. The disease was found more in the Holstein cattle and its cross (53%) where as in Jersey cattle and its cross the sample prevalence was 41% and in local cattle 6%. On examination, most of the cases were in 2<sup>nd</sup> stage of lactation followed by 3<sup>rd</sup> and 1<sup>st</sup> stages of lactation, respectively. Similarly, maximum cases were observed in 2<sup>nd</sup> parity of the animals; and occurrence of sub clinical mastitis was found to be in decreasing trend as parity increased. Mastitis is found to be more prone on the cattle living in rough floor since P value is 0.0093.

### **A study on changes in biochemical parameters in hepatic diseased dogs of Kathmandu valley**

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Keeping dog as a pet is the culture of Nepalese society. Here in Nepal total dog population is estimated approximately 1849,106. Kathmandu valley including Kathmandu, Lalitpur, and Bhaktapur has 60895 among which 52% (31665) are pet dogs, 20% (12179) are community dogs and 28% (17051) street dogs. The common breeds of dogs reared in Kathmandu valley are German shepherd, Doberman, Labrador, Japanese

Spitz, Lhasa Apso, Boxer, Pommeranian, Tibetan Mastiff, Mongrels and many others. Most common diseases of dogs in Kathmandu Valley are Canine Parvo virus. Canine distemper, various skin disease, metabolic diseases, accident, hepatobiliary & renal and others hepatic diseases are of paramount importance because of high mortality. There are many forms of hepatic diseases prevailing in Kathmandu like acute, chronic lack of proper investigation, majority handle by quacks, indiscriminate use of medicine and delay approach by qualified veterinary personnel on the last stage have created a serious problems for the proper diagnosis and treatment of hepatic disease. This is why this study was undertaken to evaluate biochemical parameter of suspected hepatic diseased dogs of Kathmandu having clinical sign like anorexia, depression, lethargy, weight loss, nausea, vomiting, diarrhea, dehydration and ascitis. The objective of this study was to find out proper diagnosis and treatment protocol of hepatic disease of dogs here in Kathmandu valley. In this study, blood and serum samples were collected from the dogs brought and suspected for hepatic disease and analyzed by STAT FAX ANALYZER. Based on the study major variation was found in serum ALT, total protein, albumin. It is concluded that serum ALT and bilirubin level along with serum albumin can be taken as the biochemical parameter for the diagnosis of the hepatic disease in dogs.

### **Prevalence of *Fasciola spp.* Among cattle and buffaloes of Dang district**

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A study was conducted during September to November 2007 to screen the liver fluke parasite among cattle and buffaloes of Dang district. Three study areas were selected namely Deukhuri, Ghorahi and Tulsipur. Altogether 360 fecal samples were collected randomly during the study. Sedimentation method was used to identify the parasite, out of 360 samples 244 were positive which showed prevalence of liver fluke at 67.77%. Out of total samples, 180 samples were from cattle and 180 were from buffaloes which showed prevalence of 132 (73.33%) and 112 (52.22%), respectively. Total 120 samples were collected from three study areas i.e. Deukhuri, Ghorahi and Tulsipur. The study showed prevalence of 94 (78.33%), 60 (50.00%) and 40 (75.00%) in those areas, respectively. The study revealed that the prevalence was high among cattle (73.33%) than buffaloes (62.22%). Better management practices can lower liver fluke infestation among cattle and buffaloes in Dang district.

## **Prevalence of infectious bursal disease (IBD) of broiler poultry in Balaju area**

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Infectious bursal disease (IBD), (Gumboro disease) is an important viral disease of poultry throughout the world clinically. It affects young chicken usually up to 3 to 7 weeks of age. The morbidity ranges from 10 % to 100 % and mortality 5 % to 20 % occasionally reaching 100 % depending upon the strain. In this study, altogether 252 samples were collected by random sampling methods from 42 poultry farms. These samples (blood) were collected from live birds (bursa of fabricius, spleen and thigh muscle) and from dead infected birds; were preserved in ice at Central Veterinary Laboratory (CVL). The samples were examined through post mortem, AGID, CAM inoculation. There were altogether 156 cases of IBD recorded, out of 40 vaccinated live birds 20 samples obtained were positive (50 %), out of 44 non-vaccinated live birds 24 were positive (54.5 %). From 96 dead vaccinated birds 56 were positive (50.33 %), 72 from non vaccinated birds 56 were positive (77.77 %). Besides that the ratio of infected to vaccinated birds was 1:1.3. The study showed that the prevalence of infectious bursal diseases was observed in Balaju. The age wise prevalence rate was the highest in 5 -7 weeks age group and least in 2 - 3 weeks of age.

## **Seroprevalence of visceral leishmaniasis in human population of Siraha district and detection of leishmania antibody in dog**

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In Nepal, visceral leishmaniasis (VL) is a major public health problem in 12 terai districts and some adjoining districts. More than 5.7 million people living in these districts are believed to be at risk of this disease. Siraha district, the study areas are adjoined with the border of Bihar state of India which is endemic for VL. Visceral leishmaniasis affects persons from the lowest socio-economic strata of the community, and the district falls under it. Hence the study population is believed to be more prone to having VL. Out of a total of 150 blood samples collected randomly during July to September, 2008 from patients (human) came to district hospital, Siraha and RSUPMS, hospital, Lahan having history of fever for 3 – 5 days, 22 (14.66%) were found positive reactors for specific and non – specific antibodies against VL with formol – gel test. And at 95% confidence interval, the percentage prevalence ranged from 9.56 to 21.5. The percentage prevalence of VL in male patients was found higher (17.39) as compared to female patients (10.34). According to the survey report which was conducted for 70 patients, the percentage prevalence of VL in patients having muddy (thatched roof) house was found higher

(24.44) than patients having pucca house group (2); and the percentage prevalence of VL in patients not using bed net was found much higher (25) as compared to patients using bed net (9.09). For the detection of leishmania antibody in dog altogether 15 blood samples were tested by rk39 antigen based dipstick test and found all negatives for leishmaniasis. Considering the higher prevalence of the disease in the population studied, suitable preventive and control measures including the quality diagnosis and treatment with the emphasis on completion of treatment, monitoring of drug resistance, vector surveillance, transmission interruption through quality Indoor Residual Spray, use of bed net, solving the problems relating to migration and poverty and awareness programs for rural people at all levels have been recommended.

### **Major feed ingredients available in Nepal and their nutrient contents**

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The study was conducted to determine the nutrients of feed ingredients used to compound concentrate feed for livestock, poultry and fish in Nepal. Two related studies were conducted, one – production potential of major feed ingredients in different parts of the country and another was their nutrient contents. Feed samples were collected from 8 districts of different regions: Terai – Janakpur and Biratnagar, mid – hills – Illam and Kaski and Valley – Kathmandu, Chitwan and Dang, and were analyzed in NARC, Animal Nutrition Division and T.U. Laboratory. Major feed ingredients produced and available in terai, hills and valley were identified and documented with their varieties, production potential and were grouped on the basis of nature of feed ingredients such as carbonaceous, proteinaceous (plant and animals sources) and minerals. Nutritional composition of different feed ingredients used in feed industry of Nepal revealed that the nutrient contents widely varied with varieties and type of feed ingredients. Nutrient contents of corn significantly differed with variety particularly in fat (EE), crude fiber (CF), calcium (Ca) and phosphorus (P). Among the soyabean varieties, mean value of CP and total ash recorded significantly different ( $p < 0.05$ ). Seti and Ransom varieties recorded highest CP content of  $42.95 \pm 2.76$  followed by brown (sathiya)  $39.14 \pm 1.94$  and local  $37.83 \pm 1.33$  percent. Moisture contents of all feed ingredients analyzed was in safe point (i.e. less than 11%) as recorded by Nepal Gazettee 2007. Among the industrial by-products, mustard cake and linseed cake were analyzed to get the information on proximate principle. The nutrient contents of analyzed cakes were not significantly different. Mineral sources like bone meal, oyster shell and Godawari marble were analyzed for major minerals such as calcium and phosphorus. Oyster shell recorded high contents of calcium (20.96 %) followed by marble powder (19.9 %) and bone meal (18.71 %). Bone meal was found to be a rich source of phosphorus as compared to other two ingredients. In conclusion, the analyzed data revealed that there was a great potential to grow feed ingredients and variation in nutritional composition of feed ingredients within the crop type and varieties that further suggested the need of periodical analysis of feed ingredients produced and used in the country.

## **A study on biochemical evaluation of hepatobiliary and renal disorders in dogs of Kathmandu valley**

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A study was conducted to evaluate hepatobiliary and renal disorders in dogs of Kathmandu valley from August to December 2008. To accomplish the study, 50 serum samples were collected from the dogs showing the signs and symptoms of hepatobiliary and renal disorders. The serum samples were analyzed in Vet Clinic, Krishnagalli, Pulchowk, Mount Everest Kennel Club, Old Baneshwor and HICAST, Gaththagar. The result showed highest prevalence of hepatobiliary disorder (54%) followed by renal (24%) and both hepatobiliary and renal disorders (12%). Among the different breeds, mongrels were highly susceptible followed by pure (German shepherd had highest prevalence) and cross breed. In age – wise prevalence, age group 5 -10 years were found to be more susceptible for hepatic disorder followed by 0 – 5 and 5 -10 age group while 10 – 15 years age group was found to be highly susceptible for renal disorders followed by 0 – 5 and 5 – 10 years age group. From this study range value of AST, ALT, bilirubin, BUN and creatinine were found to be 60 – 200 IU/L, 70 – 600 IU/L, 2 – 75 mg/dl, 33 – 36 mg/dl and 2.3 – 31.6 mg/dl, respectively.

## List of thesis researches conducted during 2004 - 2008

### **MSc (Dairy Technology)**

#### **2007**

**A study on Coliform count in various milk flow levels and sources of post pasteurization contamination** - Rajendra Prasad Adhikary

**Process optimization for the preparation of indigenous dairy product *Pustakari*** - Keshab Achhami

**Process optimization for the preparation of *Khoa* based indigenous product *Gundpak*** - Narayan Prasad Sharma

**Quality evaluation of *Juju dhau*** - Jeeva Lal Lamsal

**Study on physico-chemical constants of *ghee* produced from cow, buffalo and mixed sources** - Devendra Bhagat

#### **2008**

**Preparation and quality evaluation of probiotic yoghurt** - Choodamani Bhandari

**Study of dairy effluents in manufacturing industries** - Sushil Adhikari

**Study on qualitative evaluation of raw milk produced in Lalitpur district** - Dipendra Chaudhary

### **MSc (Meat Technology)**

#### **2007**

**Process optimization and quality evaluation of chicken dried meat “Sukuti”** - Bimal Kumar Nirmal

**Shelf – life study of buffalo meat sausage under refrigeration** - Bhim Nath Chaulagain

**Study on physico-chemical and microbiological quality of buffalo meat at retail outlets of Kathmandu valley** – Kishan Lal Bhatt

**BSc (Honours) Agriculture**

(With electives: A. Sustainable Agriculture, B. Horticulture C. Soil Science D. Plant Protection E. Agri-economics & agri-business management)

**2004****A.**

**Bio-intensive farming system: indigenous knowledge system and participatory agro-biodiversity conservation for sustainable livelihood-** Sushil Thapa

**Comparative study of bio-intensive farming system and conventional farming system (a case study of Udayapur district) -** Dipak Subedi

**Rural livestock technologies for sustainable livelihoods in agro-ecology systems (a case study of Parasnagar in Chitwan, Chapagaun in Lalitpur & Ghiling in upper Mustang) -** Pradeep Raj Rokaya

**Traditional hill farming system and food security: constraints and alternatives-** Bandana Aryal

**B.**

**A study on present situation of Japanese pear production at Machhegaun VDC, Kirtipur municipality of Kathmandu District -** Bikash Maharjan

**Comparative study of potato crop cultivation practices in upland & lowland condition -** Yubaraj Lamsal

**Study on organic pest management on vegetable crops at Riyale VDC, Kavre -** Prakash B Shah

**Study on the current status of Mandarin production in Chalnakhel VDC, Kathmandu -** Sunita Adhikari

**Study on the current status of pear (variety pharping) production in Seshnarayan & Setidevi VDCs, Kathmandu -** Anisha Bajracharya

**D.**

**Adoption of crop protection technology by farmers of Madhyapur – Thimi -** Sony Shrestha



**Disease of vegetable crops & their management adopted by farmers in Madhyapur Thimi, Bhaktapur - Pankaj Lamsal**

**Existing crop production technology in cereal & vegetable crops followed by farmers (a case study in Jhaukhel & Duwakot VDCs, Bhaktapur - Diwas Khatri**

**Farmers' knowledge attitudes & practices on integrated pest management (IPM) in summer vegetable crops in Sipadol VDC of Bhaktapur - Kiran Ghishing**

**Indigenous knowledge of farmers for the management of insect pests & diseases of agricultural importance in Gokarna VDC, Kathmandu - Shekhar Pathak**

**Indigenous knowledge of farmers for the management of wheat pests and diseases of agriculture importance in Katunje VDC - Parmila Bhattarai**

**Study on the occurrence of insect pests in vegetable crops & their management practices followed by the farmers' of Sipadol VDC, Bhaktapur - Dhiraj Puri**

**Vegetable insect pests & disease & their management adopted by farmers in Balkot VDC, Bhaktapur - Lalit Prasad Shah**

**E.**

**A study on economic benefit of Rainbow Trout farming in Nuwakot district - Samridhdi Poudyal**

**Cooperative & contractual marketing of high value crops - Gokul Gautam**

**Dairy production & marketing systems in Kavre district - Dinesh Dhungana**

**Economics of cauliflower marketing of Jiling VDC, in Nuwakot district - Sabita Khadka**

**Integrated irrigation system management in Khokana VDC - Nagina Shrestha**

**Marketing of milk & milk products in Kathmandu valley - Pooja Bhattarai**

**Marketing of poultry & poultry produces in Kathmandu valley - Deepa Pradhan**

**Poultry production and marketing system in Kavre District - Sarad Nepal**

**Study on organic nutrient management in vegetable crops at Riyale VDC, Kavre - Keshav K .C**

**2005****B.**

**Comparative advantages of organic vegetable production in bio-intensive farming system in the agro-ecological condition of Udayapur - Dipendra Chaudhary**

**Current status of persimmon (*Diospyros Kaki*) production in Kirtipur municipality and Machchhegaun VDC, Kathmandu - Nagendra S. Dhimi**

**Off- season vegetable production and its impact on income generation - Kamal Poudel**

**Organic vegetable production in Dadhikot VDC: a case study - Suresh Gnawali**

**Vegetable marketing and its information system in Kathmandu valley - Sudarshan K. Aryal**

**2006****B.**

**Bio-intensive farming system: role of intensive organic vegetable production for sustainable livelihoods - Shova Shrestha**

**Comparative study on cauliflower and tomato production between commercial and non-commercial growers - Upama Ashish Koju**

**Impact assessment of information system in vegetable production: a comparative study between bio-intensive farming system and subsistence farming system - Ammar Bahadur Bhandari**

**Impact of non – timber forest products (NTFPs) on the livelihood enhancement in - Indeshwar Mandal**

**E.**

**An assessment of NTFPs marketing problems in Dolakha district - Manohar Chandra Kunwor**

**Economic analysis of mushroom cultivation in Chapagaun VDC -Subhechchha Shrestha**

**Flower marketing in Kathmandu valley - Dhanej Thapa**

**Vegetable seed marketing in Kathmandu valley - Santosh Pandey**

**2007**

**B.**

**Assessment of growth responses of tree species in experimental bio-energy plantation** - Sabita Sharma

**Food security and livelihood in Chainpur and Birendranagar VDCs of Chitwan** - Pushpa Ghimire

**Impact of bio-intensive farming system on food security in Udayapur district** - Namita Nepal

**Non timber forest product conservation and contribution to rural livelihood (a case study in Dhanusha district)** - Binika Hada

**Present status of *Lapsi* cultivation in Kathmandu valley** - Shiva Yendyo

**Present status of orchid cultivation in Lalitpur and Makwanpur districts** – Gita Parajuli

**C.**

**Causes of soil fertility decline in maize-based cropping patterns in Sindhupalchok district** - Gautam Shrestha

**Effect of integrated crop management on soil properties and rice crop management practices in Naubise Phant irrigation System** - Dinesh Prajapati

**Impact assessment of IPNS under maize based cropping pattern (a case study in Kavre district)** – Anima Kayastha

**Soil fertility status of the land tilled by landless farmers in the eastern terai** – Diwakar Dahal

**E.**

**Economics of production and marketing of NTFPs in Dolakha District** – Goma Sigdel

**Gender issues in livestock production system (A case of Vyas municipality, Tanahun district)** – Sita Bantha

**Impact assessment of integrated pest management farmer field school on sustainable agriculture practices** – Pawan Singh Bhandari

**Impact of bio-Intensive farming system on socio-economic condition of the farmers in Udayapur district** – Amit Bhandari

**Marketing of milk and milk products in Kathmandu valley - Shashi Adhikari**

**Socio – economic changes due to off seasonal vegetable production in Rasuwa District - Bimal Prajapati**

**2008**

**B.**

**A comparative study on adoption of post harvest technologies of apple by farmers in Jumla and Mustang districts - Rajan Dhakal**

**Clubroot management practices in Bajrabarahi and Chitlang VDCs of Makwanpur district - Bijaya Godar**

**Commercial vegetable production in leasehold land for nutritional security of marginalized community in Morang district - Ashima Poudel**

**Impact assessment of organic vegetable production on food security in Udayapur - Lakshya Bahadur Chaudhary**

**Perception and practices of organic farming among the commercial vegetable farmers of Mahadevbesi, Dhading - Rashmi Joshi**

**Plastic house technology adopted by farmers for tomato production in Hyangja, Kaski - Bhogendra Kumar Khatri**

**C.**

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