NPSN: 018/079/80

Annual Report

2078/79 (2021/22)

Government of Nepal
Nepal Agricultural Research Council
National Agricultural Environment Research Centre
Khumaltar, Lalitpur, Nepal

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Cover page photo: The NAERC office in the NAHRC building

FOREWORD

The National Agricultural Environment Research Centre (NAERC), a leading centre under the Nepal Agricultural Research Council, is involved in agricultural research which is directly related to weather/climate and environmental concerns in agriculture. Greenhouse gas (GHG) emissions and their impact on climate change are one of the major global issues. Although Nepal is not a significant contributor of GHGs, it is the fourth most vulnerable country to climate change. In this context, NAERC has been collaborating within and outside NARC for the development and dissemination of the most effective adaptation and mitigation measures to limit the negative impacts of climate change and other environmental concerns. The NARC has developed many climate-resilient crop varieties and technologies. This centre has published a compilation of these technologies in the Nepali language. We are publishing agro-met advisory bulletins on a regular basis with the support of agricultural and weather/climate experts. The centre is also conducting activities on assessment of farmers' perspectives on the consequences of climate change; calculation of GHG emissions and carbon sequestration; effect of pesticide use; and the impact of increased temperature on vegetable crops. Now, the centre has focused on the identification, participatory research, and dissemination of climate-smart agricultural technologies to address the vulnerability of climate change in agriculture.

This annual report provides a detailed look at the activities and outcomes of the research undertaken by the centre during the fiscal year 2078/79. Researchers, extension staff, students, and national policymakers are likely to find this report valuable in their research and decision-making processes.

In particular, I would like to thank Mr. Bishnu Prasad Paudel, Dr. Amit Prasad Timilsina, Dr. Pradeep Shah, Alok Sharma, Rameshwar Rimal, and Hemlal Bhandari for their efforts to carryout research activities. I would also like to thank Mr. Krishna Pokhrel, Mr. Ram Kumar Rai, Mr. Raj Kumar Chalise, and Mrs. Rina Maharjan for their hard work in the areas of administrative assistance, accounting, and other services. In acknowledgment of its financial support, the Nepal Agricultural Research Council (NARC) has been praised. I would greatly appreciate constructive comments and suggestions for how to make the report better.

_____

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LIST OF ABBREVIATIONS

°C	Degree Centigrade
AAB	Agromet Advisory Bulletin
AGB	Above Ground Biomass
AWS	Automatic Weather Station
BGB	Below Ground Biomass
CO_2	Carbon dioxide
cm	Centimetre
DAP	Di-ammonium Phosphate
DAS	Days After Sowing
DAT	Days after Trasplanting
DBH	Diameter at Breast Height
DoAR	Directorate of Agricultural Research
F.Y.	Fiscal Year
GDP	Gross Domestic products
GHGs	Greenhouse Gases
ha	Hectare
HRS	Horticulture Research Station
Kg	Kilogram
m^2	Square meter
MOP	Muriate of Potash
NAERC	National Agricultural Environment Research Centre
NARC	Nepal Agricultural Research Council
NMRP	National Maize Research Program
NRRP	National Rice Research Program
$N:P_2O_5:K_2O$	Nitrogen, Phosphorous, Potash
NRs	Nepalese Rupee
OTC	Open Top Chamber
t/ha	tonne per hectare

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प्रमुख सार संक्षेप

यस वार्षिक प्रतिवेदनमा राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्रले आर्थिक वर्ष २०७८/०७९ मा सम्पन्न गरेको अनुसन्धानात्मक र प्रवर्धनात्मक कार्यहरू समेटिएका छन् । यस अवधिमा मध्य पहाड र तराईमा तरकारी खेतीमा हुने विषादीको प्रयोग बारे कृषकहरूको ज्ञान, गर्मीयाममा तापक्रम बृद्धि गरी खेती गर्दा गोलभेडाका जातहरूमा पर्ने प्रभाव, लिचीफलको बोटमा हुने कार्वन स्थिरीकरणको मात्रा, मकै बाली खेती गर्दा हुने कार्वन उत्सर्जन जस्ता कार्यक्रमहरू सञ्चालन गरिएका थिए । विगत वर्षमा जस्तै यो वर्ष पनि कृषि मौसम सल्लाह बुलेटिनको प्रकाशन र सरोकारवालाहरुलाई वितरण गरियो । यस वर्ष सबै ७५३ वटै स्थानीय तहमा वुलेटिनको पहुँच स्थापित गरियो । यस केन्द्रले जलवायु मैत्री कृषि प्रविधिको साथै कृषि मौसम सल्लाह बुलेटिनको सङगालो प्रकाशन गऱ्यो । जलवायु परिवर्तनको असर र त्यससँग अनुकुल हुने प्रविधिहरू बारे जानकारी गराउन रोभिङ्ग सेमिनारहरू सञ्चालन गरिए । यस वर्ष प्राप्त भएका मुख्य उपलब्धिहरूलाई यहाँ छोटकरीमा प्रस्तुत गरिएको छ ।

- तरकारी खेतीमा विषादीको प्रयोगको सम्बन्धमा कृषकहरूको ज्ञान बारे जानकारी सङकलन गर्न धादिङ्ग जिल्लाको धुनिवेसी नगरपालिका र चितवनको भरतपुर महानगरपालिका क्षेत्रका कृषकहरुसँग घरधुरी सर्वेक्षण गरियो । जम्मा १३३ जना कृषकहरुसँग गरिएको अन्तरवार्तामा, धुनिवेसीका ३८ र भरतपुर नगरपालिकाका ९५ घरधुरी समावेश गरिएको थियो । यस अध्ययनमा ३६.१०% महिला सहभागिता भएकोले यो सर्वेक्षण लैङ्गिक समावेशी रहेको थियो । यस सर्भेक्षणमा सहभागी कृषकहरू मध्ये केवल १.५०% लाई मात्र जलवायु परिवर्तनको बारेमा यथेष्ट जानकारी भएको पाइयो भने २३.३१% ले यस बारेमा केही पनि थाहा नभएको वताउनु भयो । सहभागीहरूलाई तरकारी वाली उत्पादनमा क्षति पुऱ्याउने जलवायुजन्य घटनाहरूका बारेमा जिज्ञासा राख्दा, अत्यधिक वर्षा (४५.११%), तुषारो (२४.२८%), असिना (१४.२९%), सुख्खा (७.५२%) र अत्यधिक जाडो (४.५१%) प्रमुख कारणहरू वताउनु भएको थियो । विषादीको प्रयोगले वातावरणमा नकारात्मक प्रभाव पर्ने, उपयोगी मित्रजीवलाई नोक्सान पुऱ्याउने तथा मानव स्वास्थ्यमा असर पुऱ्याउने बारे क्रमशः ७३, ६३ र ५६% कृषकहरू जानकार रहेको पाइयो ।
- सर्वेक्षणमा सहभागी कृषकहरू मध्ये ८७.९७% ले विषादीको म्याद समाप्त हुने मिति (expiry date), ७५.९४% ले विषादीको पर्खने अवधि (waiting period), ८५.७१% ले विषादीको सिफारिस मात्रा र ७३.६८% ले विषादीको लेभलका आधारमा विषादी खरिद गर्ने गरेको पाइयो । सबै कृषकहरूले विषादी समयमै उपलव्ध भएको जानकारी दिनु भयो । सहभागी मध्ये ५२.६३% कृषकहरू विषादी छनौट गर्न एग्रोभेटको भर परेको पाइयो । व्यवसायिक कृषकहरूले (२७.०७%) स्वविवेकले विषादी किन्ने गरेको र १३.५३% कृषकहरू विषादी छनौट गर्न

छिमेकीको भर परेको पाइयो ।

- सहभागी कृषकहरू मध्ये ९७.७४% ले रसायनिक किटनाशक विषादी प्रयोग गर्ने गरेको र ८२.७१% ले केवल रसायनिक विषादीको मात्र प्रयोग गर्ने गरेको पाइयो । १५.०४% ले मात्र प्राङ्गारिक विषादीको प्रयोग गरेको पाइयो । धादिङ्ग जिल्लाको धुनवेशीमा गरिएको सर्वेक्षणमा कुनै पनि कृषकले प्राङ्गारिक विषादी प्रयोग गरेको पाइएन ।

- तापक्रम वढाउदा गोलभेडाको उत्पादनमा पर्ने प्रभाव वारे जानकारी हासिल गर्न, गोलभेडाका ४ वटा जातहरु (एच.आर.डि.टोम. ०३५, ए.भि.टि.ओ. १७०५, ए.भि.टि.ओ. ०९२२ र ए.भि.टि.ओ. १४२२) लाई खुला ठाउँमा र माथि खुला भएको प्लाष्टिकको भकारी जस्तो संरचना (Open Top Chamber) भित्र रोप्दा, जातहरू मध्ये एच.आर.डि.टोम. ०३५ ले वढी उत्पादन दियो भने बाहिर को तुलनामा OTP भित्र वढी उत्पादन हुने अध्ययनले देखायो ।

- लिची जातको फलको रुखमा स्थिरीकरण हुने कार्वनको मात्रामापन गर्न ५ जिल्लाको विभिन्न लिचीवगानमा रहेका लिचीका वोटहरूको तथ्याङ्क लिइयो । यसरी नमूनाको रुपमा तथ्याङ्क सङकलन गरिएका लिचीको वोटको उमेर १० देखि ५० वर्षसम्म रहेको थियो । यस्तो तथ्याङ्क ४७७ वटा लिचिका रुखहरूबाट लिईएको थियो । लिचीको रूखहरूमा स्थिरिकरण हुने कार्वनको मात्रा, बोटको उमेर र डाँढको व्यासमा निर्भर हुने देखियो । सवै भन्दा बढी कार्वन स्थिरिकरण चितवनको यज्ञपुरी फार्मका ५० वर्ष पुराना लिचीका रूखहरूले गरेको पाइयो । त्यसैगरी कृषि अनुसन्धान निर्देशनालय, खजुरा, वाँकेको फार्मका १९ वर्ष पुराना लिचीका बोटहरूले सबैभन्दा कम कार्वन स्थिरीकरण गरेको पाइयो ।

- खुमलटारको ६.३ देखि ६.६ सम्म अम्लीयपन र ७.८ पानीको सूचकाङ्क रहेको मकै खेती गरिएको जग्गामा कार्वन उत्सर्जन मापन गर्दा, २१० कि.ग्रा. नाइट्रोजन (युरियाबाट उपलब्ध) प्रति हेक्टर प्रयोग गरेकोमा बढी ११९.९ मि.ग्रा/हे./घण्टाको दरले कार्वन उत्सर्जन भैरहेको पाइयो । त्यसैगरी प्रति हेक्टर १२० कि. ग्रा. नाइट्रोजन प्रयोग गरिएको जग्गामा कम (५३ मि.ग्रा/हे./घण्टा) कार्वन उत्सर्जन भएको पाइयो ।

- यस वर्ष कृषि मौसम सल्लाह बुलेटिनका ५२ अङ्क तयार पारी वितरण गरियो । यस बुलेटिनमा पशुपालन, घाँसेबाली, मत्स्य पालन, खाद्यन्न बाली, फलफूल तथा तरकारी बाली सम्बन्धी प्राविधिक जानकारी लगायत आउदो हप्ताको मौसमी पुर्वानुमान समिटिएको हुन्छ । यस केन्द्रले नेपाल टेलिभिजनको "NTV News Channel" मार्फत शनिवार ८:०० बजे पछि प्रसारण हुने कृषि समाचारको लागि आवश्यक सूचनाहरू उपलब्ध गराउँदै आएको छ ।

- कृषिमा जलवायु परिवर्तनको असर, कृषि मौसम सल्लाह बुलेटिनको उपयोगिता र नेपाल कृषि अनुसन्धान परिषद्ले विकास गरेका जलवायु मैत्री कृषि प्रविधि

वारे कृषकहरुलाई जानकारी गराउन कैलाली र जुम्ला जिल्लामा रोभिङ्ग सेमिनारहरु संचालन गरियो ।

- कृषि मौसम सल्लाह बुलेटिनको आवश्यकता, त्यसको प्रादेशिक औचित्य र त्यसमा प्रकाशित सामाग्री वारेमा पृष्ठपोषण गर्ने उद्देश्यले लुम्बिनी, कर्णाली र गण्डकी प्रदेशमा सरोकारवालाहरू तथा कृषकहरूसँग अन्तरकृया कार्यक्रम सञ्चालन गरियो ।

- जलवायु मैत्री कृषि प्रविधिहरू कृषि अनुसन्धान निर्देशनालय, लुम्लेको "नार्क प्रविधि गाउँ" बरादी लगायत अन्य वाह्य अनुसन्धानस्थलहरू र यस केन्द्रले सञ्चालन गरेका अन्य कार्यक्रमहरूमा समेत कृषकहरूलाई जानकारी गराइयो ।

- नेपाल कृषि अनुसन्धान परिषद्ले विकास गरेका जलवायु मैत्री कृषि प्रविधिहरूको सङ्गालो प्रकाशन गरियो ।

- नाइट्रोजनको विभिन्न ४ मात्राको प्रयोग गरि मकैका ३ जातहरूको उत्पादकत्वमा पर्ने प्रभाव बारे खुमलटारमा गरिएको अध्ययनमा, सुपर ९५१ भन्ने जातले सबै भन्दा बढी ३००५.८ कि.ग्रा./हे. र २१० कि.ग्रा. नाइट्रोजन प्रति हेक्टरको दरले प्रयोग गर्दा सवैभन्दा बढी (३४४२.२ कि.ग्रा./हे.) उत्पादन भएको पाइयो ।

- नेपाल कृषि अनुसन्धान परिषद्का बिभिन्न कार्यलयहरुमा कार्यरत वाली रोग विज्ञान समूहका वैज्ञानिक र प्राविधिकहरूलाई दुई दिने जलवायुमा आधारित रोग पूर्वानुमान मोडल सम्बन्धी तालिम उपलब्ध गराइयो ।

- हेलिल्यूरको मोहिनी पासो राखेर गोलभेडाको फलको गवारोको संख्या पत्ता लगाउने उद्देश्यले यस केन्द्रको समन्वयमा कृषि अनुसन्धान निर्देशनालय तरहरामा गरिएको एक अध्ययनले वैशाख महिनामा गवारोको संख्या धेरै हुने (४१ माउ गवारो/महिना) देखाएको थियो ।

- विशेष परियोजना (सि-सक्सेस) अर्न्तगत, नेपालमा विकास गरिएका जलवायु मैत्री कृषि प्रविधिहरूको एउटा सुची तयार पारियो । यस्ता प्रविधिहरूको प्राथमिकीकरण गर्न तराई (लुम्विनी प्रदेश), पहाड (गण्डकी प्रदेश) र हिमाल (कर्णाली प्रदेश) मा कार्यशाला गोष्ठीहरू सञ्चालन गरियो । छरूवा धान खेति प्रविधि र धान खेतमा पालो-पालो सिञ्चाई गर्ने र सुकाउने प्रविधिको सहभागितामूलक अनुसन्धान कृयाकलापहरू विजवनिया (पर्सा) र हरनरी (चितवन) मा शुरू गरियो ।

EXECUTIVE SUMMARY

This annual report summarizes all the research and promotion activities completed by the National Agricultural Environment Research Centre (NAERC) during the fiscal year 2078/2079 (2021/2022). During this period activities like assessment of pesticide use pattern in mid-hills and Terai, performance of tomato genotypes under elevated temperature, carbon sequestration, and GHG emission estimation were carried out. The Centre has regularly published agro-met advisories and distributed to the concerned stakeholders including all 753 local bodies (governments). NAERC also published compilation of climate smart technologies developed by NARC along with the agro-met advisory. Roving seminars were held to aware farmers about the changing climate and to advice adaptation measure. The following are some of the centre's major research outputs and other noteworthy accomplishments in fiscal year 2021/22:

- Household surveys were conducted to understand farmers' knowledge on pesticide application for vegetable production at Dhunibeshi and Bharatpur municipalities in Dhading and Chitwan, respectively. Of the 133 households surveyed, 38 were from Dhunibesi and 95 from Bharatpur. We were able to ensure the participation of 36.10% of women farmers in this survey, which made the survey more gender inclusive. The survey clearly indicated that very few farmers (1.50%) were aware of climate change while 23.31% had no idea about climate change. The major weather events affecting vegetable production in the study area were excessive rainfall (45.11%), frost (24.28%), hailstorm (14.29%), drought (7.52%), and cold wave (4.51%). Farmers who were aware of the negative effects of pesticides on environmental health, beneficial insects, and human health were 73, 63, and 56%, respectively.

- Among the participating farmers, 87.97 % considered the expiry date, 73.68 % cared for the tag level, 85.71 % cared for the recommended dose, and 75.94 % considered the waiting period of the pesticides while purchasing. All the respondents said the required pesticides were available on time. A majority (52.63%) of the farmers purchased the typical pesticide recommended by the agro-vet owners, whereas 6.67% of the farmers asked the technician to purchase a particular pesticide. In particular, commercial farmers (27.07 %) themselves chose the pesticides, and 13.53% of farmers purchased the pesticides based on their neighbors' recommendations.

- Almost all participating farmers (97.74%) used chemical pesticides. Among them, 82.71% used only chemical pesticides. About 15.04% of

farmers were using organic pesticides, whereas no farmers were using organic pesticides in the Dhading district. Mainly, farmers purchased chemical pesticides from agro-vet and some of the farmers were using home-made bio-pesticides also.

- Four tomato genotypes (HRDTOM 035, AVTO 1705, AVTO 0922, and AVTO 1422) were evaluated in open top chamber (OTC) and open field conditions. The average maximum and minimum air temperatures were higher inside OTC. All the observed parameters had higher values inside OTC than in the open field. HRDTOM 035 provided the highest yield.

- The carbon sequestrating capacity of the litchi tree (*Litchi chinensis*) was measured from some of the government-owned farms in five districts of Nepal. The age of the sample Litchi trees ranged from 10 to 50 years. A total of 477 trees were sampled from different farms. The carbon sequestration by litchi trees (t/tree) was found based on diameter and the age of the trees. The highest carbon sequestration (1.41 tonnes/tree) was observed in the trees grown at Yagyapuri Farm, Chitwan, where the age of trees was 50 years and DBH was 1.49 m. Whereas the lowest amount of carbon (0.15 tonnes/tree) was found stored in litchi trees at DoAR, Khajura, where the age of the tree was 19 years with 0.68 m DBH. However, trees aged 19 years at DoAR, Tarahara had sequestered more carbon (1.04 tonnes/ha) as compared to the trees at DoAR, Khajura. The difference in carbon sequestration in the same aged tree could be the effect of the environment and management practices.

- In a maize experimental field where a soil pH ranged from 6.3 to 6.6 and a soil moisture index was 7.8, the CO_2-C flux was recorded at the highest of 119.9 mg/ha/hr from the field with 210 kg/ha of nitrogen applied through urea. The lowest (53.9 mg/ha/hr) was found with the application of 120 kg/ha of Nirtogen. The average emission was found to be 84.6 mg/ha/hr.

- During the fiscal year, 52 episodes of the weekly agro-met advisory bulletin were prepared and distributed by the centre. The bulletin comprises agro-advisories for livestock, pasture and fodder, fisheries, food crops, fruits and vegetables, and weather forecasts for the upcoming week. The centre is assisting the NTV NEWS program after eight p.m. to broadcast agro-met advisories. The centre is helping to prepare the necessary materials to broadcast the bulletin through NTV NEWS after eight p.m. Prime News.

- Roving seminars to create awareness about climate change, the usefulness of agro-met advisory and to share adaptation technologies with farmers were held in Kailali(Terai) and Jumla districts (high hills).

- ❖ Stakeholder interaction workshops were conducted in Lumbini, Karnali, and Gandaki provinces to share importance and take feedback on agro-met advisories.

- ❖ Climate resilient agricultural technologies were shared with the farmers of the NARC technology village at Baradi, managed by DoAR, Lumle. Besides Tanahu, these technologies are also shared with farmers and other concerned stakeholders in stakeholder workshops as well.

- ❖ A compilation of climate-smart agricultural technologies entitled "Jalwayu Maitri Krishi Prabidhi Sangrah" was published.

- ❖ In an experiment with three maize genotypes and four different doses of nitrogen, the highest yield was obtained from Super 951 (3005.8 kg/ha) and 210 kg of nitrogen per hectare contributed to the highest yield (3442.2 kg/ha).

- ❖ A two-day training on a weather-based disease forecasting model for the scientists and technical officers working in plant pathology in NARC was organized on December 9 and 10, 2021.

- ❖ The population dynamics of tomato fruit borer monitored from Push (2078) to Asadh (2079) using helilure pheromone traps showed the highest population of the pest (41 moths/month) in Baisakh (April-May) in the plains (Tarahara) of Nepal.

- ❖ The climate-smart agricultural technologies developed by different organizations in Nepal were enlisted. The workshops for prioritization of climate-smart agriculture technologies were held in three provinces (Lumbini, Gandaki, and Karnali) to represent the Terai, midhills, and high hills. Participatory research was initiated with direct seeded rice (DSR) and the alternate wetting and drying (AWD) system of rice cultivation. DSR was established in five farmers' fields in Parsa district. AWD was initiated in DSR and transplanted rice in Parsa and Chitwan districts, respectively.

1. WORKING CONTEXT

About two-thirds of Nepalese people work in agriculture, which accounts for about one-third of the nation's gross domestic product. Moreover, as the population and food demand grow, it becomes imperative that the country achieve food security. Warming in the climate, in time and space, along with other abnormalities, is beginning to be a problem for all agricultural production. The collection of agro-meteorological records from numerous stations is a good source for researching the causes and effects of weather and the relationship between different weather patterns and crop yield. The crop modelling can also be aided by agro-meteorological datasets. Crop production is a result of crop genetic make-up, the environment, and the methods used for management.

An open-top chamber study of crop performance on high temperatures might aid agricultural researchers with their breeding and crop management plans. GHG emissions are of major concern and are exacerbating climate change. Agriculture has also an important role in the emission of CO_2 by agricultural practices. Some of these experiments are being conducted at Khumaltar representing mid-hill condition (Annex 11.1). Similarly, horticultural fruit crops help to sequestrate the CO_2 in the form of trees and organic matters in soil. Currently, the centre is tracking CO_2 emissions from various types of crops and pasture land that are grown under various management practices across the country. Another objective of the centre is to create an inventory of different types of fruit tree sequestration of carbon.

Nepalese agriculture is deeply affected by climate change effects like increased temperature, unpredictable rainfall patterns, increasing drought, and heat wave events. In order to limit the adverse impact, the centre is cooperating with the Ministry of Agriculture and Livestock Development (MoALD) and the Department of Hydrology and Meteorology (DHM) to prepare and distribute the agro-met advisory bulletin to farmers since 2071/72. After starting with one district, the bulletin has grown to seventy-seven districts and Nepal Agricultural Research Council (NARC) has internalized AAB generation process by its internal fund after termination of PPCR project. In addition to upcoming weather forecasts, this bulletin also has other agricultural resources such crops, fruits, vegetables, livestock, grazing, and fisheries agro-advisories. The centre is helping to prepare the necessary materials to broadcast the bulletin through a national broadcaster (NTV NEWS).

The centre is currently collaborating with several national and international organizations on various areas of researchable subjects as part of its collaboration strategy.

2. INTRODUCTION

2.1 History

The Agricultural Environment Unit was established in the fiscal year 2000 AD in Khumaltar, Lalitpur under the Directorate of Planning and Coordination, Nepal Agricultural Research Council (NARC). It was upgraded to Agricultural Environment Research Division (AERD) in the F.Y. 2013 AD. Further, the division has been upgraded as National Agricultural Environment Research Centre (NAERC) from 1st Shrawan 2077 BS (2020 AD).

2.2 Vision

A climate resilient agriculture with maximum system productivity for transformed livelihoods of farmers.

2.3 Mission

National Agricultural Environment Research Centre (NAERC) strengthens the development and adaptation of the environment-friendly, accessible and affordable improved agricultural technologies through collaborative research to advance and promote on right solutions to climate-related issues in the agriculture sector.

2.4 Mandate

The overall mandate of NAERC is to act as a key institution within NARC to develop and promote agricultural technologies adaptive to climate change and support on policy guidelines.

The specified mandates are:

- Involve in agricultural environment related research, education, monitoring, and coordination activities
- Generation and promotion of technologies for climate change related adaptations
- To help central, provincial and local governments to prepare policy guidelines related to environment-related issues in the agriculture sector
- Human resources development to work on agro-environment related issues
- Coordinate and co-operate with national and international organizations

2.5 Current thrust areas for research

- Understand farmer's perception on climate change
- Climatic variability of various locations and response of crop

- Crop performance under simulated environment (e.g. elevated temperature)
- GHGs emission under different agricultural land and system.
- Carbon sequestration in horticultural crops
- AAB preparation and its performance and efficacy at farmers' field

2.6 Infrastructure and facilities

- Automatic weather station (8): Daily agro-meteorological data recording (Temperature, rainfall, solar radiation, relative humidity, soil temperature etc.)
- Open Top Chamber (3): Experimentation on elevated temperature and CO_2 level
- CO_2 Monitor: Measuring CO_2 emission
- GPS meter: Taking coordinates of different locations
- Soil pH and moisture meter: Measuring soil pH and moisture
- Leaf area index meter
- Multi-gas analyzer

2.7 Organizational structure and human resources

The organogram of this centre is given in Figure 1 and detail of human resources in 2078/79 has been presented in Annex 11.2.

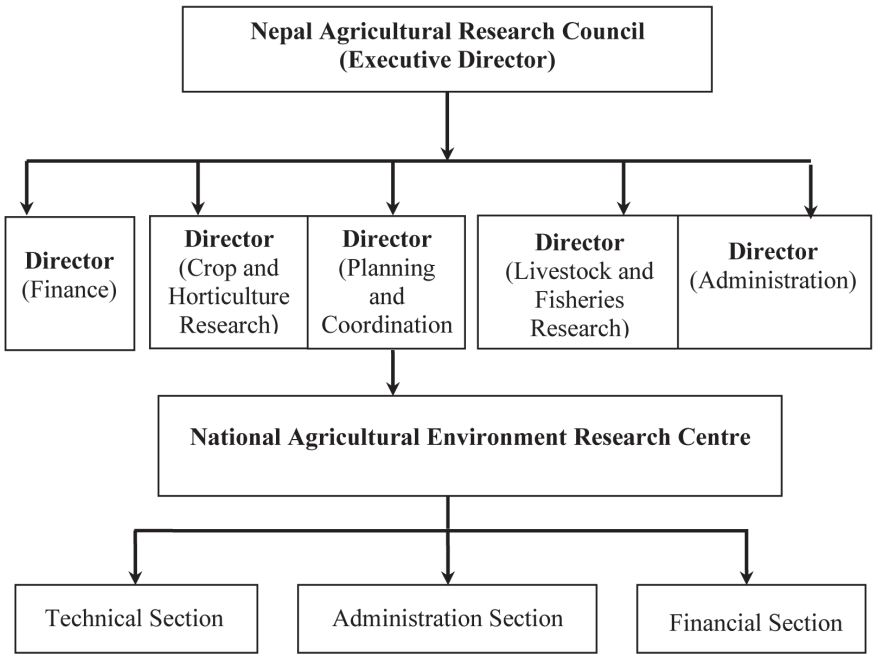

Figure 1: Organizational structure of National Agricultural Environment Research Centre

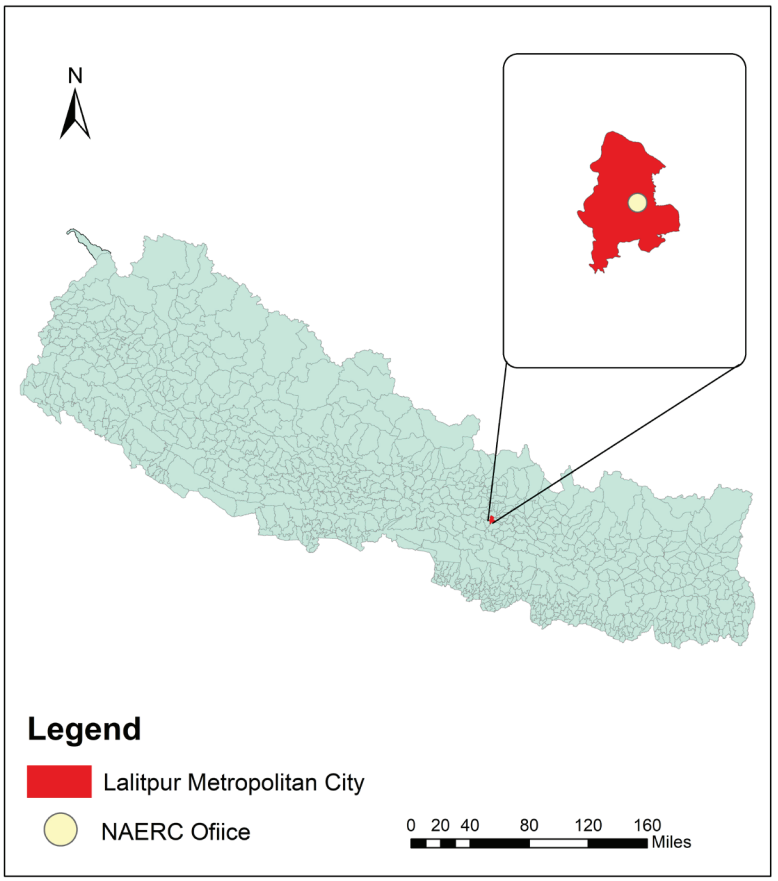

Figure 2: Location of office in Khumaltar in NAHRC facility

3. RESEARCH HIGHLIGHTS

3.1 Assessment of pesticide use for vegetable production in Dhading and Chitwan district

3.1.1 Overview of pesticide use in Nepal

Commercial vegetable production in Nepal heavily relies on chemical pesticides (Rijal et al 2006). However, there is neither a comprehensive record of the amount of pesticide import and use in agriculture nor the effect of pesticides on human or environmental health (Atreya 2007). The pesticide consumption is increasing by about 10%-20% per year in Nepal in which 500 different brands of insecticides, 7 acaricides, 229 brands of fungicides, 6 bactericides, 88 herbicides, 10 rodenticides, and 19 bio-pesticides are currently used (Khanal and Singh 2016). The use of pesticide is more intensive in the Terai regions such as Chitwan and Kathmandu valley where agriculture is more commercialized (Khanal and Singh 2016). The study was conducted among farmers of Chitwan and Dhading of Nepal, to assess the pesticide use in the vegetables.

Several chemical pesticides used in agriculture are known to cause health problems in human, livestock, and produce an adverse impact on plant diversity and environment in both short and long run (Atreya 2007, Pimentel et al 1993, Stern et al 1959). In long run, pesticide exposure can cause long-lasting health issues such as dermatosis, cancer, and genotoxic, neurotoxic, and respiratory effects (Wesseling et al 2001).

3.1.2 Climate change perspective

Nepal is a mountainous, land-locked country that sits in a seismically active zone, harbours different climate zones and experiences frequent extreme weather events. Due to climate change, the frequency and intensity of natural hazards in Nepal is rising. The Observed Climate Trend Analysis Report (2017) prepared by the Department of Hydrology and Meteorology (DHM), Nepal based on temperature and precipitation data from the year1971 to 2014 finds out that the average annual temperature increase rate of Nepal is 0.056°C.

Nepal is already witnessing the impacts of climate change and disasters in different socio-economic sectors and systems. The disasters negatively impact livelihoods and the built environment, increasing the vulnerability of the local population. The economic impact of climate change is massive. Current climate variability and extreme events lead to major economic costs in Nepal. Extreme events are dominated by floods, but also include rainfall variability on agriculture (rain-fed agriculture, soil erosion, droughts) and low-season river flows reducing hydroelectricity generation. The estimated direct cost of these events is equivalent to 1.5-2% of current GDP/year (approximately US$ 270-360 million/year in 2013

prices), and is much higher in extreme years, rising to 5% or more. This is high by international standards. Consideration of the additional indirect and macro-economic costs could increase current estimates by 25-100%.

3. 1.3 Study sites

Dhading (Dhunibesi municipality)

Dhading lies in the Bagmati Province and the district covers an area of 1926 sq.km. Geographically the district spreads from 27˚40′ N to 28˚17′ N and 80˚17′E to 84˚35′ E. Major out let of the district is Prithvi highway which connects the district to Kathmandu, Pokhara and Bharatpur.

Dhunibeshi is a municipality located within the Dhading District. The municipality spans 96.30 square kilometers with a total population of 31,029 according to 2011 Nepal census report. On March 10, 2017, the Government of Nepal restructured the local level bodies into 753 new local level structures. The municipality is divided into 9 wards, with Naubise declared the administrative center of the municipality.

Chitwan (Bharatpur metropolitan city)

Chitwan is one of 77 districts of Nepal, and is located in the southwestern part of Bagmati Province. The district covers an area of 2,238.39. The people inhabiting the Chitwan District are predominantly peasant farmers cultivating mainly food and cash crops. The land of Chitwan is spotted with silt and clay, which is very good for growing rice, wheat and vegetables such as cabbage, cauliflower, radish, potatoes, broccoli, cucumbers, pumpkins, sweet potatoes and carrot.
Bharatpur is the third most populous city of Nepal after Kathmandu and Pokhara with 369,377 inhabitants in 2021. It is also the second largest metropolitan city in Nepal by area. It is the district headquarter of the Chitwan District.

Chitwan district is one of the consistent vegetable suppliers for the major vegetable market of the country including the capital city, Kathmandu (Rijal et al 2018). The district was selected for this study purposively because of commercial and intensive vegetable cultivation and high volume of pesticide use (Khanal and Singh 2016).

The research was conducted on two sites, namely Dhunibesi municipality of Dhading and Bharatpur metropolitan city of Chitwan district. These sites are purposively selected because of commercial and intensive vegetable cultivation and high volume of pesticide use. Total of 133 farmers, 38 from Dhunibesi and 95 from Bharatpur were included in the sample. The sample selection was done by simple random sampling technique having minimum 0.033 ha (1 kattha) of land under vegetable cultivation. Primary data were collected through household survey by using semi-structured questionnaires. Secondary data collection was done through the desk study of grey literatures and various authentic publications.

3.1.4 Major findings of the survey

Demographic features

During the survey, the education level, household income and land holding of the participating farmer recorded. These characteristics are briefly discussed in the report.

Gender perspective

Among the participating farmers, male respondents constituted 63.90% whereas 36.10% women farmers also shared their view (Table 1). Interesting, more women farmers were interviewed in Dhading district where they constituted 52.63% of the total respondents.

Table 1: Gender composition of the participating farmers

	Dhading	Chitwan	Total
Male	18	67	85 (63.90)
Female	20	28	48 (36.10)
Total	38	95	133

Parenthesis indicates percentage

Level of education

Most of the farmers participated in this study were literate (Table 2). Among them, 5.26% had gone to university, 29.32% passed higher secondary level degree, 49.62% were literate, and only 15.80% of them did not get opportunity to be literate. Unfortunately, no one from Dhunibesi had an opportunity to complete university level of education.

Table 2: Education level of the participating farmers

	Illiterate	Literate	High school	University degree	Sub-total
Dhunibesi	3	23	12	0	38
Bharatpur	18	43	27	7	95
Total	21 (15.80)	66 (49.62)	39 (29.32)	7 (5.26)	133

Parenthesis indicates percentage

Land holding and income

Of the 0.45 ha of land that the individual farmer had in Dhunibesi, they used 0.38 ha for vegetable cultivation. Contrastingly, farmers in Bharatpur metropolitan city had an average land holding of 2.20 ha. Due to the large acreage of the land, the area under vegetable cultivation was also high (1.90 ha). The average annual household income from vegetable production was estimated to be NRs. 2.36 lakh in Dhunibesi while it was as high as NRs. 8.67 lakh per household in Bharatpur.

Vegetable crops

Study sites are the pocket areas of vegetable production. Farmers were cultivating solanaceous, cruciferous and cucurbitaceous vegetable crops namely; tomato, brinjal, cauliflower, cabbage, cucumber, pumpkin, gourd, bean, cowpea etc.

Support from government sector

Among the participating farmers, 34% of them had received some sorts of support in vegetable production from government sector. They have received support mainly on tractor, plastic tunnel and water pump.

Farmers' perception on climate change

During study respondents were asked if they know or hear about climate change, out of total 133 respondents, majority (50%) of the respondents replied that they were a little bit aware of climate change, 23.31% respondents replied that they don't know anything about climate change, 18.80% respondents replied that they are clearly know the climate change and remaining 1.50% respondents replied that they clearly knew about climate change (Figure 3).

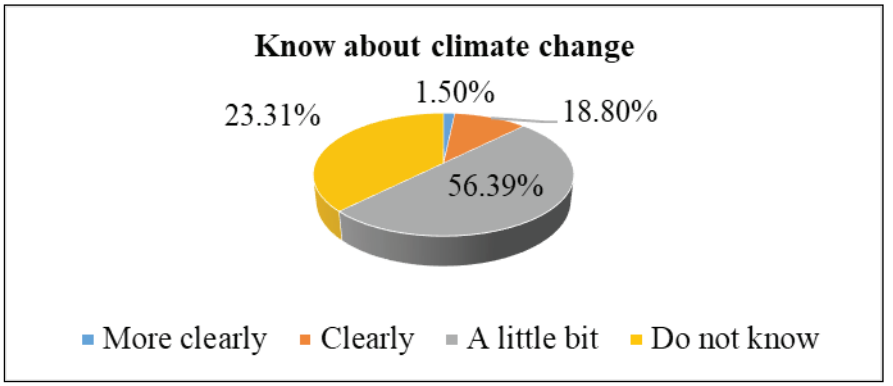

Figure 3: Perception of participating farmers about climate change

Climate hazards and crop

Our agriculture system is highly affected by climate-induced hazards. The survey indicated that excessive rainfall (45.11%), frost (24.28%), hailstorm (14.29%), drought (7.52%), and cold wave (4.51%) are major climate-induced hazards which heavily affect the productivity and economic return of the vegetable crops in the survey area.

Awareness about pesticide

Farmers in the survey area were aware of the harmful effects of pesticides. A majority (73%) of them said that they knew pesticides were harmful to the environment. Similarly, 63% of the respondents said they knew insecticides

might kill beneficial insects too. Of the total, 56% of respondents claimed that they found human health-related problems due to pesticide applications. Major problems observed due to pesticide applications were skin allergies, respiratory problems, cancer, eye itching, headaches, and vomiting. However, a majority (57%) of the farmers said they did not hesitate to apply pesticides in their fields to minimize the risk of pests to the crops.

The study revealed that farmers (74.44%) decided when to apply pesticides based on prevailing weather conditions. During the pesticide applications, they consider weather parameters such as rainfall, wind, temperature, frost and dew. Among the surveyed farmers, a majority (68.42%) applied pesticides based on pest symptoms, some (27.07%) of them followed routine based applications, and only a few (4.51%) used pesticides based on probable incidence of pests due to upcoming weather. During purchasing pesticides, 87.97 % considered expiry date, 73.68 % cared the tag level, 85.71 % cared recommended dose and 75.94 % considered waiting period of the pesticides.

All the farmers agreed that the availability of pesticides on their doorstep was not an issue. It was quite crucial that a majority (52.63%) of the farmers bought the pesticides as recommended by the agro-vet owners (Figure 4). Only 6.67 % took expert advice while purchasing particular pesticides. In particular, commercial farmers (27.07 %) themselves chose the pesticides against a particular pest, and the remaining 13.53% of farmers followed the recommendation of their neighbours.

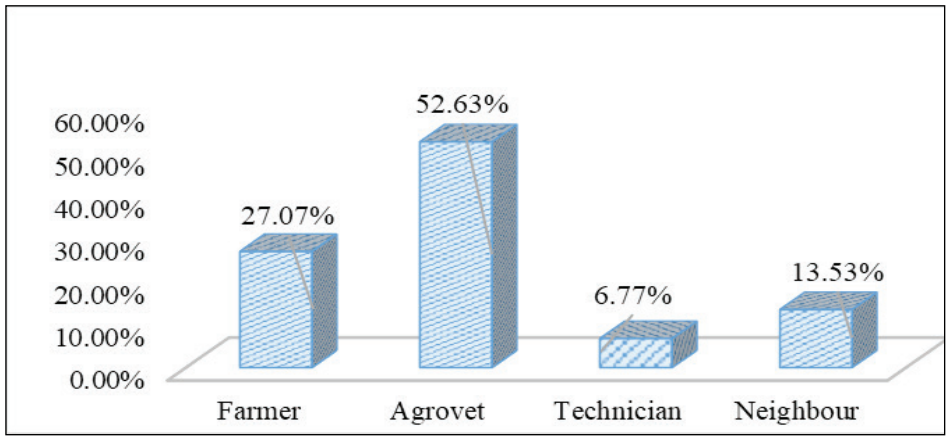

Figure 4: Who makes the decision on insecticide purchasing?

Type of pesticides

Vegetable producers (97.74 %) interviewed in Dhunibeshi and Bharatpur used chemical pesticides for pest control (Table 3). However, they also used other forms of pesticides. Among them, 82.71 % completely relied on chemical pesticides. Some of the growers

(15.38%) also used bio-pesticides. Unfortunately, not a single farmer was found practicing other means of pest management besides chemical pesticides in Dhunibesi. Farmers were purchasing chemical pesticides from the agro-vet, and some of the farmers were also found practicing home-made pesticides to control pests.

Table 3: Types of pesticides used for vegetable production in survey area

	Dhading	Chitwan	Sub-total
Chemical	38	72	110 (82.71)
Bio-pesticide	0	3	3 (2.26)
Both	0	20	20 (15.04)
Sub-total	38	95	133

Parenthesis indicates percentage

3.2 Response of tomato genotypes to higher temperature grown under Open Top Chamber (OTC)

Tomato is one of the major commercial vegetable crops of Nepal. It is cultivated from plains to mid hills during different period of the years. Ambient temperature plays key role in defining proper season for tomato production. Ambient temperature is important to agriculture because it influences plant growth and crop productivity. Therefore, it is crucial to identify the effect of temperature on tomato genotypes so that its adaptability could be known.

An experiment was carried out to assess the performance of four tomato genotypes (HRDTOM 035, AVTO 1705, AVTO 0922, AVTO 1422) in the open field, and in the open top chamber (OTC) at Khumaltar. The OTC was used to provide an elevated temperature condition for tomato genotypes during summer season. The growing conditions (OTC and open field) were considered as main plots and tomato genotypes as sub-plots.

Seeds of tomato sown on plug trays on 9th March, 2022. Seedlings that were 28 days old (about one month old) were transplanted while keeping a 50 cm space between each row and plant. Fertilizers, FYM, irrigation and other cultural operations were practices as recommended. The average maximum, minimum air temperatures between transplanting (April) to July (last harvesting affected by rain) were found to be higher under OTC than in open field condition. Relative humidity was remained around 99% throughout the season in both the conditions. Morphological characters (height, number of leaves/plant), number of fruits/cluster (inflorescence) and tomato fruit per plant was observed. All the observed parameters recorded higher in the OTC than the open field condition (Table 4). The first harvest was possible within 45 and 52 DAT in the chamber and open field condition, respectively. HRDTOM 035 provided more fruit yield as compared to the others. Due to continuous rain in July combined with virus like infection and tomato leaf miner (*Tuta absuluta*) collapsed the plant within 68 DAT.

Table 4: Response of tomato genotypes under OTP and open field conditions

Treatment	Plant height (30 DAT)	No. of branches (30 DAT)	No. of leaves (30 DAT)	No. of fruit per cluster	fruit (gm)/plant (up to 68 DAT)
Growing conditions					
OTC	44.35	5.16	46.77	3.29	216.39
Field	32.03	5.33	37.01	3.14	114.81
Genotypes					
HRDTOM 035	37.6	4.63	30.34	3.12	340.56
AVTO 1705	47.23	7.79	61	3.74	171.17
AVTO 0922	36.75	5.31	57.33	3.16	155.33
AVTO 1422	31.19	3.25	18.13	2.62	42.96

3.3 Estimation of CO_2 sequestration by Litchi fruit tree

Plant biomass is the major sink of atmospheric carbon dioxide as trees stores it for a long period (Brahma et al., 2021).Therefore, plantation plays crucial role for removing CO_2 from atmosphere and has important role in mitigating climate change. Moreover, fruit orchards are not only the source of fruits but also the sink of atmospheric carbon dioxide (Shrestha and Malla 2016). According to the Kyoto Protocol from 1997, every nation on earth is required to help reduce greenhouse gas emissions by either increasing carbon sequestration or reducing emissions. The process of taking carbon dioxide from the atmosphere and storing it in soil, water, or plant biomass is known as carbon sequestration. As Nepal has also contributed to carbon stocking, its national carbon stock has been estimated to be 246 to 393 M t carbon (Gibbs et al 2007). Though the forestry sector has done a quite good job in quantifying the carbon sequestration by forest trees, the process itself is in a very primitive stage in the agriculture sector.

A study was under taken by the National Agricultural Environment Research Centre (NAERC) to estimate the carbon storing capacity of Litchi tree (*Litchi chinensis*) grown mainly in government owned farm (Table 5) of five districts of Nepal. The age of the sample Litchi trees ranged from 10 to 50 years. The total 477 trees were sampled from different farm. To calculate the carbon sequestration the diameter at breast height (DBH) of the plant was measured at 1.3 m above ground level and the plant height was calculated using an angle measured by clinometers. The DBH for the tree is found by taking the square root of the sum of all squared branches at breast height explained in Nature Conservation Practice Note No. 02 (Rev. Jun 2006). The above and below-ground tree biomass and carbon sequestered by Litchi trees within one-hectare of land was calculated following the procedure described in Timilsina et al (2019). The below-ground

biomass was determined multiplying above ground by 0.26 as a factor as proposed by Cairns et al. (1997). Wood density values were compiled from Zanne et al (2009) to calculate biomass of the plant. The carbon stored in angiosperms were calculated multiplying total biomass by 0.521 as a factor as proposed by SERC (2015). The canopy size, height, age of the tree, and girth diameter are the major determinants of sequestered carbon as tree biomass.

The carbon sequestration by litchi trees (tonnes/tree) was found based on diameter and the age of the trees (Table 5). The highest carbon sequestration (1.41 tonnes/tree) was observed in the trees grown at Yagyapuri Farm, Chitwan where the age of trees was 50 years and DBH was 1.49 m. Whereas the lowest amount of carbon (0.15 tonnes/tree) was found stored in litchi trees at DoAR, Khajura where the age of tree as 19 years with 0.68 m DBH. However, tree aged 19 years at DoAR, Tarahara had sequestered more carbon (1.04 tonnes/ha) as compared to the trees at DoAR, Khajura. The difference in carbon sequestration in the same aged tree could be the effect of environment and management practices.

Table 5: Carbon sequestration by Litchi trees in different farm of Nepal

S. N.	Orchard name and location	No. of samples	Tree age (year)	Diameter at breast height (m)	Tree height (m)	Carbon sequestrated (t/tree)
1	Yagyapuri farm, Chitwan	91	50	1.49	12.17	1.41
2	Rampur college, Chitwan	50	25	1.32	10.60	0.98
3	Ganesh farm, Letang, Sunsari	30	10	1.02	6.06	0.33
4	DoAR, Tarahara, Sunsari	49	19	1.44	9.27	1.04
5	DoAR, Tarahara, Sunsari	52	20	1.46	10.21	1.18
6	Tropical fruit, Sarlahi	50	18	1.19	8.76	0.70
7	DoAR, Parawanipur, Bara	52	45	1.25	9.54	0.83
8	Dhawal samsher farm, Banke	50	15	1.00	7.23	0.44
9	DoAR, Khajura, Banke	53	19	0.68	5.73	0.15

3.4 Estimation of carbon (CO_2-C) emission from maize field

Greenhouse gases trap heat and make the planet warmer. Human activities are responsible for almost all of the increase in greenhouse gases in the atmosphere

over the last 150 years (IPCC 2007). As the second largest carbon flux in terrestrial ecosystems, the soil CO_2 flux is closely related to the atmospheric CO_2 concentration. The soil CO_2 flux is the sum of biotic respiration and abiotic geochemical CO_2 exchange; however, little is known about abiotic CO_2 fluxes in cropping areas. Farming practices including use of excessive fertilizers and mismanagement of natural resources has posed serious threat in contribution of CO_2 emission from soil. However, it is generally believed that CO_2 emission from the soil and CO_2 fixation by the plant during photosynthesis process is a self-sustaining system and there is balance between carbon released from soil and fixed by the plant through photosynthesis. CO_2 flux from agricultural soil mainly depends on microbial activities on organic matter and a number of abiotic and biotic factors can also affect it. It generally increases with rise in temperature (Lloyd and Taylor 1994). Low level of soil moisture limits microbial and root respiration. Higher emission of CO_2 from soil depletes the organic matter content and thus reduces the soil productivity as well as fertility. So, it is necessary to monitor CO_2 emission rates in different cropping pattern to formulate the plan to reduce overall agricultural emission. The study was carried out at the National Agronomy Research Centre, Khumaltar to estimate CO_2 -C emissions from maize fields with different nitrogen doses (120, 150, 190, and 210 kg/ha) in 2078/79. Soil temperature, pH and moisture were recorded in the study. The collection of gas samples was done by the Japanese closed chamber technique and finally subjected to measurement with the help of a CO_2 monitor. Soil moisture and pH were taken by a combined soil moisture and pH meter. The temperature of the soil was measured at a depth of 8 cm. The gas samples were collected in an interval of one month each.

Table 6: CO2 -C Emission from maize field with different doses of nitrogen

S.N	Nitrogen dose (kg/ha)	Air Temp. (°C)	C-flux mg/ha/hr	Soil Temp. (°C)	Soil pH	Moisture index
1	120	29.8	53.9	17.7	6.3	7.9
2	150	29.8	75.8	18.4	6.5	7.8
3	190	30.2	88.7	18.1	6.6	7.7
4	210	30.3	119.9	17.7	6.5	7.9
Average		30.0	84.6	18.0	6.5	7.8

The pH of the soil ranged from 6.3 to 6.6 and the soil moisture index was 7.8. Similarly, the air temperature ranged from 29.8 to 30.3 ℃ during the gas collection process. The CO2 -C flux was recorded at the highest of 119.9 mg/ha/hr from the field with 210 kg/ha of nitrogen applied through urea. The lowest (53.9 mg/ha/hr) was found with the application of 120 kg/ha of Nirtogen in a maize field. The average emission was found to be 84.6 mg/ha/hr (Table 6).

3.5 Generation of weather forecast based agro advisory bulletin (AAB)

A total of 52 episodes of the agro-met advisory bulletin had been prepared by an expert team in collaboration with the Department of Hydrology and Meteorology (DHM). Weather statistics of the past week were provided by the Agro-met Section whereas the weather outlook for the coming week was provided by the Meteorological Forecasting Division (MFD) of the DHM. Seasonal outlook as well as Special weather alert provided by the DHM was also considered in the preparation of the advisory. The expert team used to analyze the problems faced by the farmers, reported on the Kisan Call Centre conducted by the National Agricultural Technology Information Centre (NATIC), as well as weather statistics and the outlook for the generation of advisories. The bulletin had been disseminated through the Google group, email, website, mobile app, television, and SMS services. A sample of the agro-met advisory bulletin (1st issue of 8th year published on 2nd Baishakh 2079) has been provided in the Annex-11.6

3.6 Roving seminars for farmers of Kailali and Jumla

Typically the roving seminars are of one-day duration and bring together farmers from a group of villages to a centralized location in any given region. Farmers are given information in local language on aspects of weather and climate in the region, including climate change topics and better risk management. Farmers provide feedback on the weather and climate issues in their farming operations and the nature of assistance needed for better adaptation. The main objective of these seminars is to make farmers more self-reliant by helping them become better informed about effective weather and climate risk management for the sustainable use of natural resources for agricultural production. Another objective is to increase the interactions between the farmers, agriculturists and the National Meteorological and Hydrological Services (DHM personnel). The Roving Seminars will help raise the awareness of the farming community of the current advances in the provision of weather and climate information for facilitating operational decisions on farm. Feedback obtained from the farmers will help the personnel from the Meteorological Services and the Agriculturists to design more improved products for use by farmers and to improve the channels of communication to provide information to the farmers.

3.6.1 Roving seminar in Kailali district

The roving seminar on the application of agro-meteorology for increasing agricultural production was held on 24th Poush, 2078. The multi-disciplinary team of the experts visited Malakheti and Masurita of the Kailali district to understand the weather and agriculture related problems faced by the farmers in recent years. The main objective of the seminar was to show how farmers can benefit from the weekly Agro-met Advisory Bulletin (AAB) prepared by the NARC. Half-day seminar was conducted at Malakheti and another seminar was conducted at Masuriya of Kailali district. The farmers' fields and farms were monitored in both of locations. They were advised to read the Agro-met Advisory Bulletin (AAB)

prepared by the NARC on weekly basis. They were also advised to download and frequently update NARC Krishi and Hamro Krishi mobile application to get advises and forewarning given for the coming week thoroughly.

Farmers of Malakheti were more excited to receive the AAB in regular interval. They have also shared experience that one organization asked for service charge to get regular update on weather and agriculture advisories. We assured that they will receive the information without any cost from proper governmental channel. Farmers from Masuriya were more interested in diseases of livestock especially goat, cow and buffalo. We found parasites as well as infertility in goat and cow were major problems. The livestock and veterinary sector expert in the team tried to provide solutions of some problems. The expert team visited three farmers farm and discussed on various issues they were facing. Few farmers also discussed on subsidy provided by PMAMP.

Rice-wheat-fallow and Rice-fallow-fallow were major cropping pattern of khet land. Vegetable-vegetable was major cropping pattern in Bari land. Vegetable-maize and maize-tori (mustard)-fallow were other important cropping patterns in the district.

3.6.2. Roving seminar in Jumla district

The Roving Seminar on the application of agro-meteorology for increasing agricultural production was held on 25-26, Chaitra, 2078. The multi-disciplinary team of the experts visited Dillichour and Rini of the Jumla district to understand the weather and agriculture related problems faced by the farmers in recent years. The same team visited the Sinja on 26th Chaitra, 2078 and conducted a half-day seminar. The main objective of the seminar was to show how farmers can benefit from the weekly Agro-met Advisory Bulletin (AAB) prepared by the NARC. Half-day field visit was done at Dillichour and another half-day visit was done at Rini of Jumla district. The farmers' fields and farms were monitored in both of locations. They were also advised to download and read the Agro-met Advisory Bulletin (AAB) from NARC Krishi and Hamro Krishi mobile application. Farmers from both the locations-Dillichour and Rini shared that apple production has decreased due to unavailability of chemical pesticides/insecticides due to the cabinet decision for the adoption of organic agriculture.

The major problems faced by the farmers in these areas are:

(i) धानबालीमा रोग बढ्दै गएकोले धान लगाउने क्षेत्रफलमा कमी आएको
(ii) अर्गानिक प्रदेश घोषणा गरेकोले विषादी प्रयोग गर्न नपाएको, जसले गर्दा स्याउमा रोग, कीराको प्रकोप बढ्दै गएको, उत्पादन कम भएको
(iii) स्याउको फूल र चिचिला लाग्ने समयमा कालो तुसारोको समस्या
(iv) कोदोमा बाला कालो भएर कुहिने समस्या
(v) सिमीमा पात बटारिने, पात झर्ने

(vi) मकैमा दुध पस्ने समयमा हन्के (GLS) को समस्या
(vii) आलुमा रातो कमीलाको समस्या
(vii) आलुमा ऐंजेरु रोग

Comments/Feedbacks/Suggestions based on roving seminars

i) There was a general agreement that the seminar demonstrated the importance of agro-meteorological applications for agriculture. This type of seminars should be continuous and must involve more people so as to facilitate the implementation of agro-meteorological extension services;

ii) There should be an improvement of forecasts that can be applicable directly to the local conditions, instead of being based on large areas;

iii) Stronger team work and coordination is needed between meteorologists, agriculture personnel, and the media for the strengthening of agro-meteorological extension service to farmers;

iv) There must be a system where real time data at meteorological stations can be available locally to the farmers, as requested;

v) Strengthening of the Palika's agriculture section is very important for delivering agro-meteorological service to the local farmers;

vi) Regular feedback from end users/farmers is necessary to improve the AAB;

vii) The mass media must give more attention to the dissemination of agro-meteorological advisories and information to farmers.

viii) Limited farmers are receiving SMS. So the coverage should be extended.

3.7 Stakeholders interaction workshop on importance of AAB

3.7.1 Lumbini Province

One day stakeholder's interaction workshop was organised on 20th Chaitra, 2078 at Ministry of Agriculture, Food Technology, and Land Management, Lumbini Pradesh, Butwal, Rupendehi. The workshop was chaired by Mr. Tika Ram Chapagain, chief of National Agricultural Environment Research Centre (NAERC), Khumaltar, Lalitpur and chief guest was Mr. Baikuntha Adhikari, secretary, Ministry of Agriculture, Food Technology, and Land Management, Lumbini province. The guests were from the different divisions under Ministry of Agriculture Food Technology Land Management, Lumbini province Lumbini province, National Wheat Research Program (NWRP) Bhairahawa. Other participants were chief of Agriculture Knowledge Centre (AKC) Palpa, Nawalparasi and Rupandehi, chief of Veterinary Hospital and Livestock Service Expert Centre (VHLSEC), Palpa and Rupandehi and Chief of Prime Minister Agriculture Modernization Project (PMAMP), Rupandehi, representatives from

Agriculture NGOs and farmers from the same province and media persons.

After short introduction, there was three presentation on different issues. The first presentation was from Dr. Amit Prasad Timilsina, Scientist, NAERC, Khumaltar, Lalitpur on "Effectiveness of climate friendly agro-climatic advisory bulletin and role of Province". Second presentation was from Mr. Anup Tiwari, Ministry of Agriculture Food Technology Land Management, Lumbini Pradesh, Butwal, Rupendehi on "The current state of the Smart Agriculture Village Program and its coordination with research and educational institutions". Third presentation was from Mr. Tika Ram Chapagain, Chief, NAERC, Khumaltar, Lalitpur on "Climate smart agricultural technologies: Priorities of Lumbini Province".
Some major comments on presentations were:

1. Mr. Tika Ram Chapagain
   - AAB bulletin is prepared for the whole country but its access to the farmers is limited. Provincial ministry should play proactive to provide the information to the farmers.

2. Mr. Amar Raj Ghimire
   - There is not special mechanism to spread the messages of AAB bulletin to local farmers since only limited farmers visit agricultural offices.
   - DoAR, Khajura has initiated farmer call center. If it is linked to FM radio, local farmers can get information on climate from FM radio.
   - Information of AAB should be disseminated from local FM radios on Provincial level
   - Bulk SMS can be more effective

3. Mr. Tulsi Ram Bhandari, Chief (Livestock section), Lumbini Province, Butwal
   - There is information technology officer in every municipalities, so, they can be utilized for dissemination of climatic information

4. Mr. Ram Pandey, (Directorate of Agriculture development)
   - Climate smart village should be established in every villages

5. Mr. Shalik Ram Gautam (Crop Development Officer)
   - Digital display board should be established in local level and information regarding climate can be displayed.

6. Mr. Narayan Kafle, PMAMP
   - FM radio and local television should be more effective for dissemination of climatic information

7. Mr. Anil Baniya, AKC, Rupandehi

- Information can be disseminated through facebook

8. Mr. Baikuntha Adhikari, Secretary, Lumbini province
   - Facilitators of SMART AGRICULTURE program can dissiminate information of AAB to local levels
   - Media persons can be linked with AAB bulletin
   - Information can be broadcasted from FM radio on free of charge
   - Ministry of Agriculture, Food technology and Land management can disseminate these information to Agriculture Knowledge Centres and Veterinary Hospital and Livestock Service Expert Center

Participants showed their keen interest to address the risk and uncertainties in the agriculture sectors to achieve goal of sustainable agriculture. They were enthusiastic to learn, prepare and issue the AAB on province level themselves. Discussion was more centered to solve the farmers' real problems using and improving the bulletin and stakeholders had opinion to use efficient channel to get feedback from the farmers. Workshop was successful to identify systematic issues for the betterment of AAB. Views, ideas and experience shared by stakeholders will be helpful for AAB preparation.

3.7.2 Karnali Province

One day stakeholder interaction workshop was organised on 24th Chaitra, 2078 at Ministry of Land Management, Agriculture and Co-operative, Karnali Province, Birendra Nagar, Surkhet. The workshop was chaired by Mr. Amar Bahadur Pun, Director, Directorate of Agricultural Research, Karnali province and the chief guest was Dhan Bahadur Kathayat, chief of Agriculture Development Division and spokesperson of MOLMAC, Karnali Province. The guests were from the different divisions under MOLMAC, Karnali Province; Agriculture and Livestock Business Promotion Training Centre, Karnali Province. Other participants were chief of Agriculture Development Office, Salyan; chief of Veterinary Hospital and Livestock Service Office, Salyan; Vice-President, National Farmers Group Federation; and the representative from the PMAMP-PIU, Surkhet, representatives from Agriculture NGOs and farmers from the same province.

The interaction workshop was followed by the three presentations. The first presentation was from Dr. Amit Prasad Timilsina, Scientist, NAERC, Khumaltar, Lalitpur on "Effectiveness of climate friendly agro-climatic advisory bulletin and role of Province". The second presentation was from Mr. Mahesh Acharya, MOLMAC, Karnali Province, Surkhet on "The impact of climate change in agriculture sector of Karnali Province". The third presentation was again from Dr. Amit Prasad Timilsina, NAERC, Khumaltar, Lalitpur on "Climate smart agricultural technologies: Priorities of Karnali Province".

3.8 Sharing climate resilient technologies with the farmers of NARC technology village

NAERC had participated on the plant and animal health clinic organized by the Directorate of Agricultural Research (DOAR), Gandaki Province, Lumle on NARC technology village-Baradi, Tanahu and its outreach sites- Dhamilikuwa, Lamjung and Babiyachour, Myagdi. The first clinic was held at Baradi, Tanahu on 8th Kartik, 2078 and the second was held at Dhamilikuwa, Lamjung on 9th Kartik, 2078. The third clinic was organized on 26th Falgun at Babiyachour, Myagdi. In each locations, more than 100 farmers participated and benefited from the program. They showed the keen interest on the content of the AAB but the majority of the farmers participated were found unaware about the AAB service of the NARC. More than 80 samples of soil, 40 samples of milk (for mastitis) and the faecal (Gobar) was analyzed and provided the report to the respective farmers on each locations. NAERC delivered a power point presentation on Agro-met Advisory Bulletin service of the NARC, and displayed a poster on the research activities conducted by the NAERC on climate change adaptation.

Interaction during the workshop helped a lot to identify the problems faced by the farmers and the researchable issues on different agro ecological zones of Nepal. The chairman of the respective municipalities were convinced for the establishment of two-way communication mechanism to address the problems faced by the farmers and the technologies developed by the NARC

3.9 Publication of the climate resilient technologies generated by NARC

Changing agri-food systems to adopt ecologically friendly and climate-resilient practices is the goal of a strategy known as climate-smart agriculture (CSA). CSA is in favor of achieving internationally recognized objectives including the SDGs and the Paris Agreement. The CSA approach pursues the triple objectives of sustainably increasing productivity and incomes, adapting to climate change and reducing greenhouse gas emissions where possible (FAO 2010). NARC has constantly been engaging itself in the development of climate resilient agriculture technologies which may fulfil all or some objectives of CSA. NAERC has compiled such technologies in Nepali language which is entitled as “Jalwayu Maitri Krishi Prabidhi Sangrah” in 300 copies (Annex 11.4). It covers the major technologies developed by NARC which meets the characteristics of CSA technologies. The publication serial number is NPSN: 139/078/079.

3.10 Effect of nitrogen on yield of maize under rainfed condition

For the majority of farmers in Nepal’s hills, growing maize is their way of life. It is a perennial crop grown on sloping Bari land (rainfed upland) in the hills for food, feed, and fodder. It is grown under rainfed conditions from April to August as a single crop or later in the season is relayed with millet. The agriculture

sector in Nepal accounts for around 65.5% of the labour force and makes up 25.83% of the country's gross domestic product (GDP). The total area occupied by maize in Nepal is 956,447 hectare of land and productivity of 2387 kg/ha in 2018/19 (MoALD 2020). Hybrid technology has had a significant impact on many nations around the world, with a hybrid revolution and significantly altering maize output. However, it requires more input, and one crucial factor that must be taken into account is nutrition. Therefore, four levels of nitrogen dosages were used to study how different varieties responded. Hybrid kinds of maize produce 20-30% more than other improved varieties. Seven maize hybrids have been registered and distributed by the National Maize Research Program (NMRP), Rampur, however they are not appropriate for all of Nepal's agro-climatic regions. Just 10% of Nepal's entire maize land is hybridized. The main issues with hybrid maize cultivation in Nepal include a high cost of hybrid seed, a large anthesis-silking interval, poor seed set, challenges with early generation lines, untimely availability of inputs (irrigation, fertilizer, pesticides, etc.), the need for seed replacement every season, and high irrigation.

This experiment was conducted at National Agronomy Research Centre, Khumaltar, Nepal (latitude 27.40 N, longitude 85.20 E, 1350 m) under rainfed condition. The experiment was carried out utilizing a split plot design, where varied nitrogen levels were deemed the sub plot and variety was considered the main plot. Maize varieties (JKHM 502, MM 1107 and Super 951) were planted with the spacing of 20 cm (plant to plant) and 60 cm (row to row) respectively. Four nitrogen level (120,150,180 and 210 kg/ha) were considered and the experiment had three replication. Phosphorous and Potash was applied at rate of 60 and 40 kg/ha basis. The individual plot size was 2.5 m wide and 4.2 m long. Intercultural operation was followed as per the recommendation for rainfed maize. Nitrogen was applied through line placement in three splits at basal dose followed by 30 days after seeding (DAS) and second top dress 45 DAS. GenStat tool was used for statistical analysis.

The result showed that Super 951 variety had higher yield as compared to other two varieties with 3005.8 kg/ha while JKHM 502 had 2913.4 kg/ha and MM 1107 had 2845.8 kg/ha (Table 7). The yield for maize was found highest in 210 kg of nitrogen with the yield of 3442.2 kg/ha as compared to 180, 150 and 120 kg of nitrogen with the yield as 3092.7, 2724.5 and 2427.2 kg/ha respectively. The stover yield was found highest in Super 951 with 4948.8 kg/ha as compared to 4649.7 and 4776.1 kg/ha in MM 1107 and JKHM 502 varieties respectively. While comparing the yield for nitrogen dose the stover yield was found highest in 210 kg of nitrogen with yield of 5764.9 kg/ha as compared to 180, 150 and 120 kg of nitrogen per hectare with the yield of 5111.5, 4422.9 and 3866.9 kg/ha respectively. The thousand grain weight ranged from 239.8 gm to 251.5 gm within the varieties and 241.6 to 251.8 within the nitrogen dose. The cob length was found highest in JKHM 502 variety with 16.3 cm and lowest in Super 951 with 15.6 cm.

Table 7: Effect of nitrogen doses on morphological, yield attributing characters and yield of maize genotypes

Treatment	Plant height (cm)	Plant population/ ha	Cob length (cm)	Cob dia (mm)	Grain rows per cob	Number of grains per grain row	Grain weight (kg/ha)	Stover yield (kg/ha)	1000 grain weight (gm)
Varieties									
JKHM 502	168.32	6050	16.3	44.5	15.0	30.2	2913.4	4776.1	243.2
MM 1107	172.73	6383	16.1	44.8	14.9	29.3	2845.8	4649.7	251.5
SUPER 951	161.68	6100	15.6	43.9	15.2	29.5	3005.8	4948.8	239.8
Nitrogen dose									
N120PK	165.5	5988	15.8	43.6	15.2	28.2	2427.2	3866.9	241.6
N150PK	171.1	6167	16.1	44.3	14.8	29.4	2724.5	4422.9	251.8
N180PK	165.5	6311	16.1	44.8	14.8	30.3	3092.7	5111.5	248.0
N210PK	165.5	6244	16.1	44.9	15.3	30.8	3442.2	5764.9	238.0

3.11 Plant disease epidemiology and weather based modelling training

A management approach called plant disease forecasting is used to foresee the occurrence or alteration in the severity of plant diseases. Growers employ these systems at the field level to decide on the most cost-effective disease control measures. Prediction models are in use for plant diseases including late blight of potato and are essential decision-making tool in different countries. However, the development of late blight incidence and or forecasting models is new to Nepal. Therefore, this training was organized to discuss and plan future pathways to late blight disease prediction models and their use for the disease management in Nepal. The specific objectives were:

1. to provide a general introduction of plant disease epidemiology, prediction models, and their uses for plant disease management with focus on late blight of potato,
2. to study two case studies for the development of prediction models,
3. to provide hands-on experience to develop disease prediction models, and
4. to prioritize disease and weather variables for future disease prediction and decision support tools in Nepal.

Forecasting assists the growers for spray schedule and reduces the costs involved by eliminating the unnecessary sprays and labour cost without increasing the risk of losing the crop. Forecasting is an ecologically and economically sound approach like cultural, biological control methods which plays an important role in the management of diseases and pest. National Agricultural Environment Research Centre conducted two days training program for the scientist and technical officer working in plant pathology in NARC on December 9 and 10, 2021. Training was focused on modelling of late blight disease occurrence.

1. General introduction: Plant disease epidemiology
2. Use of disease forecasting models for late blight management
3. Quantitative data analysis using linear regression model
4. Qualitative data analysis using logistic regression model
5. Late blight epidemiology: critical factors in different landscape and environment
6. Use of current data for late blight model development

3.12 Population dynamics of tomato fruit borer

Tomato productivity in Nepal is around 18.01 t ha^{-1}, which is half of global productivity and far less than that of Southern Asia (FAOSTAT, 2020; MoALD, 2020). Among many biotic factors that reduce tomato yield, Tomato fruit borer, *Helicoverpa armigera* is one of the major polyphagous pest which feeds on more

than 15 crops (Vinutha et al 2013). In Asia, including Nepal, it affects more than 100 economically significant plants and greatly harms tomato crops in terms of both quality and quantity (Muthukumaran and Selvanarayanan 2016). This insect is widespread across the country and is considered as the national priority pest in Nepal (Manandhar 1997). This pest is becoming a major threat of winter season tomato for the last few years in Nepal. Tomato is grown as an Autumn-Winter crop in Terai, inner Terai and foot hills of Nepal (Ghimire et al 2017). Monitoring of this pest was carried out in Khumaltar as well as in DoAR, Tarahara.

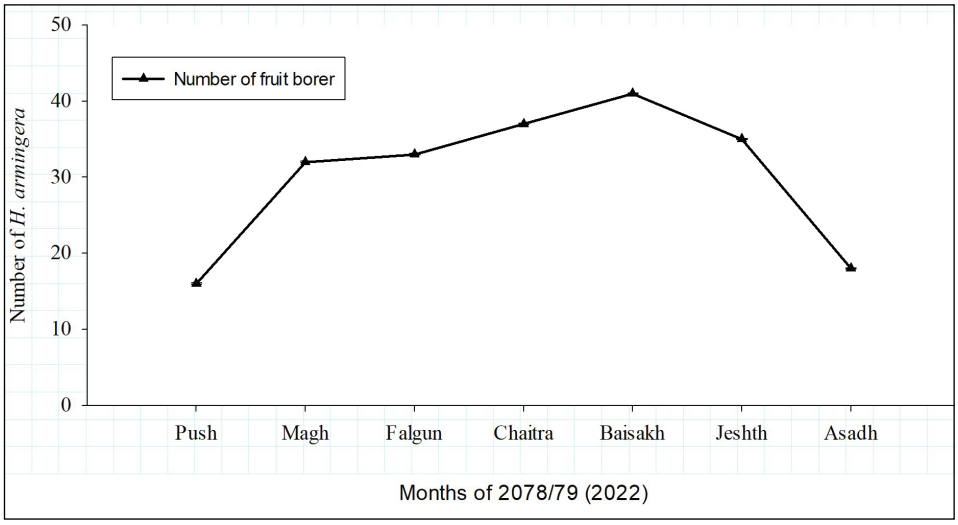

Figure 5: Population dynamics of *H. armigera* at DoAR, Tarahara in 2078/79

The population dynamics of tomato fruit borer was recorded from Push (2078) to Asadh (2079) using helilure pheromone traps (Figure 5). Population of pest monitored in 2 days interval. Based on the available data, the highest number (41/month) of *H. armigera* was recorded in Baisakh (April-May). However started to increase rapidly (32/month) from Magh (February-March) and sharply declined (35/month) after Jestha (May-June) towards Asadh (18/month). The distribution of fruit borer over the months clearly matches with the production season of tomato in plains of Nepal. This pest was more prevalent in last week of April in plain area of Nepal (Shah et al 1988). Likewise, Rijal et al (2007) recorded the highest number of *H. armigera* moths during third week of March in Chitwan condition. The observation made in this study are also in agreement with the earlier studies carried out in plains of Nepal (Maharjan 2002, Sha et al 2007).

At Khumlatar, Heli-lure traps were kept from February to July 2022. Very few numbers of *H. armigera* adults were trapped. There were only one, two and one moths were observed in March, May and June, respectively.

3.13 Consortium for scaling-up climate smart agriculture in South Asia (C-SUCSeS)

3.13.1 Develop Inventory of Climate Smart Agriculture (CSA) Technologies

The review has been done on climate smart agriculture technologies developed in Nepal. The major source of information was the Nepal Agricutlural Research Council. The information were collected from the proceedings, annual reports, leaflets, booklets and journal articles etc. A list of CSA technologies (30 technologies) has been created for different cropping system (rice-rice, rice-wheat, rainfed mixed, highland mixed) as specified in the C-SUCSeS project document.

3.13.2 Prioritization of CSA technologies-Lumbini province

One-day stakeholder's interaction workshop was organized on 2nd April, 2022 at Ministry of Agriculture, Food Technology, Land Management, Lumbini Province, Butwal. The workshop was chaired by Mr. Tika Ram Chapagain, national focal point- C-SUCSeS and chief guest was Mr. Baikuntha Adhikari, secretary, Ministry of Agriculture Food Technology Land Management, Lumbini province. In the interaction program, directors of livestock and crop sectors of the province ministry, Chief of Agriculture Knowledge Centre (AKC) Palpa, Nawalparasi and Rupandehi, chief of Veterinary Hospital and Livestock Service Expert Centre (VHLSEC), Palpa and Rupandehi and Chief of Prime Minister Agriculture Modernization Project (PMAMP), Rupandehi, representatives from Agriculture NGOs and farmers from the same province and media persons were presented. Chief of National Wheat Research Program also participated in the program. Altogether, there were 34 participants in the interaction workshop, in which, 30 were male and 4 were female.

Ministry of Agriculture Food Technology Land Management, Lumbini province has been conducting the Smart Agriculture Village Program in coordination with research and educational institutions. We discussed the status of the program and tried to related how these activities will be scaled up. From group discussion, we prioritized some the promising climate smart agricultural technologies for Lumbini Province.

According to stakeholders, some basis for climate smart agriculture (CSA) technology prioritization are:

i.Sustainable agriculture

ii.Crop diversity

iii.Sustainability

iv.Resource conservation

v.Higher production

vi.Economy
vii.Market
viii.Social preference

Ranking of some climate smart agriculture technology by stakeholders of Lumbini province based on:

1. Rice-rice cropping system
    i.Laser land levelling
    ii.Rice variety resistant to submerged condition
    iii.Integrated plant nutrient management
    iv.Community seed bank
    v.Seeding time
2. Rice-wheat cropping system
    i.Early maturity variety
    ii.Laser land levelling
    iii.Integrated plant nutrient Management
    iv.Irrigation management
    v.Agro-met advisory
3. Rainfed cropping system
    i.Agro-met advisory
    ii.Mixed farming
    iii.Rain water harvesting
    iv.Integration of legumes
    v.Integrated nutrient management
4. Highland mixed
    i.Scientific management of grazing land
    ii.FYM improvement
    iii.Integrated plan nutrient management
    iv.Integration of legume crops
    v.Rain water harvesting

3.13.3 Prioritization of CSA technologies-Karnali province

Climate smart agricultural technology prioritzation workshop was conducted in Karnali Province on 6th April, 2022 at Ministry of Land Management, Agriculture and Co-operatives, Karnali Province to prioriize and understand the scaling up strategies of the CSA technoligies. The workshop was chaired by Mr. Amar Bahadur Pun, director of Directorate of Agricultural Research, Surkhet, Karnali Province and chief guest was Mr. Dhan Bahadur Kathayat from Ministry of Land Management, Agriculture and Co-operatives, Karnali Province. Other participants were from Agriculture Knowledge Centre, Local NGOs, National Plant Pathology Research Centre, National Agronomy Research Centre, National

Entomology Research Centre, Prime Minister Agriculture Modernization Project (PMAMP), farmers from same province. Overall, there were 25 participants, among them, 22 were male and 3 were female. Interaction with farmers was also carried out in Rini, Dillichaur and Sinja of Jumla district (high hill, Karnali province). In the field discussion program more than 20 female farmers were actively participated.
Following are the technoloiges ranked by the stakeholders at Karnali province.

1. Rice-wheat cropping system
    i. Drought tolerant rice varieties
    ii. Community seed bank
    iii. Solar water lifting
    iv. Integrated nutrient management
    v. Inclusion of legumes in system
    vi. Agro-met advisory bulletin

2. Rainfed cropping system
    i. Rain water harvesting
    ii. Micro irrigation
    iii. Mulching
    iv. Agro-forestry
    v. Community seed bank
    vi. Agro-met advisory bulletin

3. Highland mixed
    i. Rain water harvesting
    ii. Range land management
    iii. FYM
    iv. Intercropping
    v. Community seed bank

3.13.4 Prioritization of CSA technologies-Gandaki province

One-day workshop was accomplished in Gandaki province on 22nd June, 2022 at Aanbu Khaireni Rural Municipalities, Tanahu. The workshop was chaired by chief of Aanbu Khaireni Rural Municipalities Mr. Sukra Chuman and chief guests were chief of Goat research program, Bandipur and Horticulture research program, Malepatan, Pokhara. Likewise, guests were for director of DoAR, chief of fisheries research program, Pokhara, chief of Prime Minister Agriculture Modernization Project (PMAMP), Tanahu. Other participants were from Agriculture Knowledge Centre (AKC) Tahanu Chief of Prime Minister Agriculture Modernization Project (PMAMP), Gorkha, representatives from Agriculture NGOs and farmers from the same province. The total number of participants were 39, in which, 32 were male while 7 were female. The same

process of technology prioritization as in other provinces was completed in Gandaki province with major focus on the mid hills condition.

Following are the technoloiges ranked by the stakeholders at Gandaki province.

1. Rice-wheat cropping system
    i.Drought tolerant rice varieties
    ii.Direct seeded rice
    iii.Mulching
    iv.Agro-met advisory bulletin
    v.Insect pest tolerant varieties

2. Rainfed cropping system
    i.Insect pest tolerant varieties
    ii.Agro-met advisory bulletin
    iii.Agriculture insurance
    iv.Drought tolerant rice varieties
    v.Integrated nutrient management

3. Highland mixed
    i.Rain water harvesting
    ii.Scientific management of grazing land
    iii.Fodder management
    iv.Intercropping
    v.Community seed bank

3.13.5 Validation/viability assessment of CSA technologies through participatory research

After identifying and prioritized CSA technologies through stakeholder workshop, the most promising technologies were validated through participatory research in farmers' field. For this, two agro-systems were selected i.e. rice-rice and rice-wheat. For rice-rice agro-systems, Harnari of Chitwan district and for rice-wheat agro-systems, Jagarnath rural municipality-3, Bijbania of Parsa district was selected. It is the initiation of participatory research. Participatory research initiated on DSR at 5 farmers field while AWD at 2 farmers field.

In Bijbania, 5 farmers (Table 8) were selected to practice Direct Seeded Rice (DSR) on their rice cultivated land. All farmers are practicing direct seeded rice method of crop establishment using Bahuguni Dhan-2 variety. They were supported for seed, fertilizer, herbicides and rental cost of machines. Mr. Abhay Yadav will use 20 kattha land for direct seeded rice method and remaining 20 kattha for transplanting method. The farmer's nearby the DSR area also received Bahuguni Dhan-2 and followed their own practices. It will help to make comparison with DSR practice and transplanted method. All the activities are monitored by Agriculture Implement Research Center, Ranighat, Parsa.

Table 8: Name of the participating farmers' on direct seeded rice research

S. N.	Farmers name	Area (kattha)
1	Mr. Abhay Yadav	40
2	Mr. Pun Ram Sah	6
3	Mr. Raj Chettri Yadav	6
4	Mr. Binay Yadav	5
5	Mr. Raj Banshi Yadav	8

Note: (30 kattha= 1ha)

In Chitwan, AWD is being practiced in rice field with Sabitri variety transplanted using the machine. In case of Bijbania, AWD is being practiced under DSR with Bahuguni Dhan-2 variety.

4. TECHNOLOGY TRANSFER AND SERVICES

Services
Information regarding climate change and climate smart agriculture technologies, was provided to various concern stakeholders.

Publications
Besides the annual report, a compilation of agro-met advisory bulletin (500 copies) published and distributed to concerned (Annex 11.4). A compilation of climate smart agricultural technologies developed by NARC (300 copies) was published as titled" जलवायु मैत्री कृषि प्रविधि संग्रह in Nepali language.

Information through media
Various interviews related to climate change and its impact on Nepalese agriculture were broadcasted/published on various media.

5. VISITS

Visit of students from Tribhuvan University, Agriculture and Forestry University, CTEVT and personnel's from NGOs, INGOs, GOs regarding meteorological and climate change information.

6. OTHER ACTIVITIES

Participation in different training and workshop by different personals from the centre is given in Annex 11.5.

7. BUDGET AND EXPENDITURE

The total annual budget and expenditure of the centre for regular projects are provided in details in from Annex 11.8. The budget and expenditure of special project (C-SUCSeS) is given in Annex 11.9. Revenue generated from various activities and Beruju status of the centre is provided in Annex 11.10 and Annex 11.11, respectively.

8. KEY PROBLEMS

- Insufficient technical human resources to represent different disciplines.

9. WAY FORWARD

- Expansion of climate change related research activities to other research stations.
- Establishment of Environment Unit in each Agricultural Research Directorate and commodity program of NARC.
- Strengthening human resource and laboratory facilities to conduct climate change related research work in NARC system.
- Coordination with different organizations to provide agro-met advisory based on weather forecasting for agriculture use.

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11. ANNEXES

Annex 11.1: Monthly meteorological data of Khumaltar, Lalitpur, 2078/79 (2021/22)

Month/Year	Mean Temperature (°C)		Total rainfall (mm)	Rainy days
	Maximum	Minimum		
July 2021	27.4	20.8	397.7	29
August 2021	27.4	20.6	215.8	26
September 2021	27.8	19.5	131.5	21
October 2021	26.8	16.8	31.2	8
November 2021	22.2	11.2	-	-
December 2021	16.6	4.2	45.2	3
January 2022	17.1	4.4	4.7	3
February 2022	17.7	4.4	50.0	3
March 2022	26.2	11.0	0.2	1
April 2022	28.4	15.2	28.8	6
May 2022	27.3	17.1	196.7	25
June 2022	28.2	20.0	204.0	22
Mean/Total	25.1	13.8	1305.8	147

Annex 11.2: Human resources in 2078/79 (2021/22)

S.N.	Name of the Staff	Designation	Remarks
1	Dr. Tika Ram Chapagain	Senior Scientist (S-4)	
2	Mr. Bishnu Prasad Paudel	Senior Scientist (S-3)	
3	Dr. Amit Prasad Timilsina	Scientist (S-1)	Deputed from HCRP
4	Dr. Pradeep Shah	Scientist (S-1)	
5	Mr. Alok Sharma	Technical Officer (T-6)	
6	Mr. Rameshwar Rimal	Technical Officer (T-6)	
7	Mr. Ram Kumar Rai	Admin. Officer (A-6)	
8	Mr. Krishna Prasad Pokhrel	Account Officer (A-6)	
9	Mr. Hemlal Bhandari	Technician (T-5)	
10	Mr. Raj Kumar Chalise	Driver	Deputed from NASRI
11	Mrs. Reena Maharjan	Lower Technician	

Annex 11.3: Summary of progress of NARC research projects and activities in 2078/79 (2021/22)

Project code number	Name of project/activity	Project/ Activity Leader	End Year	Major progress/achievements
1	Farm management and Research Support Project	Tika Ram Chapagain		
Activity 1	Farm security and maintenance	Tika Ram Chapagain		Farm security well maintained
Activity 2	Research support	Tika Ram Chapagain		All research supports made available as per requirements
Activity 3	Annual Report and other publication	Tika Ram Chapagain		100 units of annual report was published
224	Assessing vulnerability of Climate Variability/ Change in Agriculture	Tika Ram Chapagain		
Activity 1	Collection, Processing and dissemination of met data of various location of Nepal	Rameshwar Rimal		Data collected.
Activity 2	Assessment of pesticide use on vegetables in mid-hill and Terai	Alok Sharma/ H Bhandari		Household survey on pesticide use pattern in vegetable production was conducted at Dhunibeshi municipality, Dhading and Bharatpur municipality, Chitwan. A total of 133 farmers, 38 from Dhunibesi and 95 from Bharatpur were interviewed during the survey. The survey was gender inclusive which included 36.10% of woman farmers as a respondent. Almost all participating farmers (97.74 %) use chemical pesticide and 82.71 % farmer uses only chemical pesticides. Out of total, 15.38% farmers are using organic pesticides whereas nobody farmers are using organic pesticides in the Dhading district.
Activity 3	Performance study of tomato under elevated temperature	AP Timilsina/H Bhandari		Four tomato genotypes (HRDTOM 035, AVTO 1705, AVTO 0922, and AVTO 1422) were evaluated in open top chamber (OTC) and open field condition.

Project code number	Name of project/activity	Project/ Activity Leader	End Year	Major progress/achievements
Activity 4	Estimation of CO_2 sequestrated by fruit (Litchi) trees	AP Timilsina		Carbon sequestration capacity of Litchi tree (*Litchi chinensis*) was measured from some of the government owned farm of five districts of Nepal. The highest carbon sequestration (1.41 ton/tree) was observed in the trees grown at Yagyapuri Farm, Chitwan where the age of trees was 50 years and DBH was 1.49 m.
Activity 5	Estimation of carbon emission from maize field	Alok Sharma/ H Bhandari		In an experimental field with soil pH of 6.3-6.6 and the soil moisture index of 7.8, the CO_2-C flux was recorded at the highest of 119.9 mg/ha/hr from the field with 210 kg/ha of nitrogen applied through urea.
228	Generation of weather forecast based agro-advisory	Rameshwar Rimal	2079	
Activity 1	Generation of weather forecast based weekly Agro Advisory Bulletin (AAB)	Rameshwar Rimal	2079	In total, 52 episodes of the weekly agro-met advisory bulletins were prepared and distributed by the centre.
Activity 2	Roving Seminar for farmers	R Rimal, expert members	2079	The roving seminar were conducted in Kailali and Jumla districts.
Activity 3	Stakeholders interaction workshop on importance of AAB	R Rimal, NAERC staffs	2079	The national stakeholders meeting has been conducted in Lumbini, Karnali and Gandaki provinces.
Activity 4	Sharing adaptation strategies on climate resilient technologies to the farmers of NARC technology village	Rameshwar Rimal	2079	Climate resilient agricultural technologies were shared with the farmers of NARC technology village at Baradi managed by DoAR, Lumle. Beside Tanahu, these technologies also shared to farmers and other concerned stakeholders in stakeholder workshops as well.

Project code number	Name of project/activity	Project/ Activity Leader	End Year	Major progress/achievements
Activity 5	Publication of the climate resilient technologies generated by NARC	Tika Ram Chapagain	2079	A compilation of climate smart agricultural technologies entitled as "Jalwayu Matri Krishi Prabidhi Sangrah" was published.
470	Assessment of climate change impact on maize in Nepal	Alok Sharma	2079	
Activity 1	Varieties cum nitrogen study in maize under irrigated condition	Alok Sharma	2079	In an experiment with three maize genotypes and four different does of nitrogen, the highest yield was obtained from Super 951 (3005.8 kg/ha) and 210 kg of nitrogen per hectare had contributed to the highest yield (3442.2 kg/ha).
713	Development of Forecasting Model for Potato Leaf Blight and Fruit Borer in Nepal		2082	
Activity 1	Explore prevalence of late blight of potato and fruit borer in nearby vicinity	Alok Sharma/ Hemlal Bhandari		In Khumaltar, very few fruit borer adults were recorded. In summer season potato, no prevalence of late blight recorded.
Activity 2	Training to technical personnels on minimum data collection for forecasting purpose	Amit Prasad Timilsina/ Alok Sharma		A two days training on weather based disease forecasting model for the scientists and technical officers working in plant pathology in NARC was organized on December 9 and 10, 2021.
Activity 3	Scoring disease incidence of potato late blight	Amit Prasad Timilsina/Hem Lal Bhandari		No late blight appeared in late season potato
Activity 4	Establishment of heli-lure trap and data collection	Amit Prasad Timilsina/ Rameshwar Rimal		The population dynamics of tomato fruit borer monitored from Push (2078) to Asadh (2079) using helilure pheromone traps showed the highest population of pest (41 moths/month) in Baisakh (April-May) in plains (Tarahara) of Nepal.
Activity 5	Collection of weather parameters	Rameshwar Rimal		Information collected and presented in annex.

Annex 11.4: Publications in 2078/79 (2021/22)

S. N.	Title of publication	Type	Language	Author	No. of copies
1.	Annual Report 2078/79 (2021/22). National Agricultural Environment Research Centre, Khumaltar, Lalitpur, Nepal	Report	English	National Agricultural Environment Research Centre, Khumaltar	100
2.	कृषि मौसम सल्लाह वुलेटिन	सङ्ग्रह पुस्तिका	नेपाली	विषय विशेषज्ञ समुह	500
3.	जलवायु मैत्री कृषी प्रविधि संग्रह	सङ्ग्रह पुस्तिका	नेपाली	चापागाई र साथिहरू	300

Annex 11.5: Training/workshop/seminar attended by staff in 2078/79 (2021/22)

S. N.	Name of staff	Position	Name of Training/seminar/ workshop	Duration	Place/Country	Organizer
1.	Dr. Tika Ram Chapagain	Chief	Training workshop on Agro- DSS and development of the agro-met advisories	30th May-3rd June 2022	Pune, India	RIMES and UK-met office
2.	Dr. Amit Prasad Timilsina	Scientist (S1)	,,	30th May-3rd June 2022	Pune, India	RIMES and UK-met office
3.	Mr. Rameshwar Rimal	Technical Officer (T6)	,,	30th May-3rd June 2022	Pune, India	RIMES and UK-met office

Annex 11.6: Agro-met advisory bulletin (1st issue of 8th year published on 2nd Baisakh 2079)

कृषि-मौसम सल्लाह बुलेटिन

[Agro-ment Advisory Bulletin (AAB)]

नेपाल कृषि अनुसन्धान परिषद्, राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्रद्वारा
जल तथा मौसम विज्ञान विभागसँगको सहकार्यमा जारी

वर्ष-८, अंक-१ | अवधि: २-८ बैशाख, २०७९ | २ बैशाख, २०७९

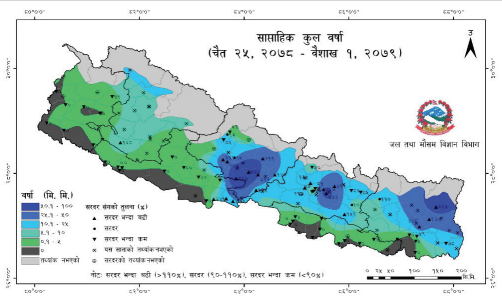
मौसमी सारांश:

- गत साता देशको धेरैजसो भू-भागहरुमा वर्षा मापन भएको छ। गण्डकी प्रदेशको लमजुङ जिल्लामा रहेको खैरीनिटार केन्द्रमा ९६.३ मि.मि. वर्षा मापन भएको छ। देशको उच्च पहाडी भू-भागहरु बाहेकका अन्य धेरैजसो भू-भागहरुमा साप्ताहिक औसत अधिकतम तापक्रम २५ डि.से. भन्दा बढी र न्यूनतम तापक्रम २५ डि.से. भन्दा कम मापन गरिएको छ। साथै, तराईको धेरैजसो भू-भागहरुमा ३५ डि.से. भन्दा बढी अधिकतम तापक्रम र २० डि.से. भन्दा बढी न्यूनतम तापक्रम मापन गरिएको छ।
- ***हिमाली भूभाग:*** प्रदेश नं-१, बागमती प्रदेश र गण्डकी प्रदेशमा साताको अन्त्यमा सामान्य देखि पूर्ण बदली रहनेछ। कर्णाली प्रदेश र सुदूरपश्चिम प्रदेशमा साताको शुरु र अन्त्यमा आंशिक देखि सामान्य बदली रहनेछ। थोरै स्थानहरूमा हल्का हिमपातको संभावना रहेको छ।
- ***पहाडी भूभाग:*** प्रदेश नं-१ र गण्डकी प्रदेशमा साताको अन्त्यमा सामान्य देखि पूर्ण बदली रहनेछ। बागमती, कर्णाली र सुदूरपश्चिम प्रदेशमा साताको अन्त्यमा आंशिक देखि सामान्य बदली रहनेछ। केही स्थानहरूमा मेघगर्जन/चट्याङ्ग सहित हल्का वर्षाको संभावना छ।
- ***तराई भूभाग:*** प्रदेश नं-१, मधेश प्रदेश र बागमती प्रदेशमा साताको अन्त्यमा आंशिक देखि सामान्य बदली रहनेछ। गण्डकी, लुम्बिनी र सुदूरपश्चिम प्रदेशमा साताको अन्त्यमा आंशिक बदली रहनेछ। एक-दुई स्थानमा मेघगर्जन/चट्याङ्ग सहित छिटपुट देखि हल्का वर्षाको संभावना छ।
- हिमाली तथा पहाडी भूभागमा अधिकतम तथा न्यूनतम तापक्रममा कुनै उल्लेखनीय परिवर्तन नहुने तर तराई भूभागमा अधिकतम तथा न्यूनतम तापक्रम दुबै केही बढ्ने संभावना रहेको छ।

कृषि सारांश

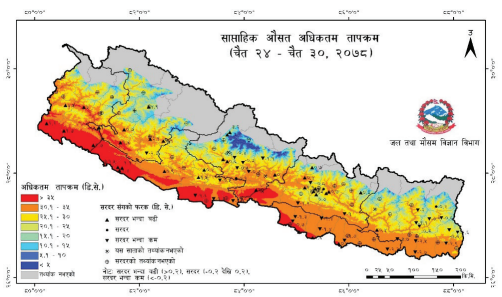
- जुम्ला लगायतका उच्च पहाडी क्षेत्रमा वर्षे धानको ब्याड राख्ने समय भएकोले लेकाली धान-१, लेकाली धान-३, चन्दननाथ-१ र चन्दननाथ-३ मध्ये उपलब्ध जातको बीउ २.५ के.जी .प्रति रोपनीका दरले व्यवस्था गर्नुहोस्।
- पाकेको गहुँबाली तथा मुसुरोबाली मौसमको अवस्था हेरि भित्र्याउनुहोस्।
- मुंग लगाउनु हुने कृषकहरुले कल्याण, प्रतिक्षा र प्रतिज्ञा मध्ये उपलब्ध जातको बीउलाई राइजोबियम जीवाणुले उपचार गरी १-१.५ के.जी. बीउ प्रति कट्ठाका दरले छर्नुहोस्।
- सुख्खा मौसम रहेकोले सबै किसिमका फलफूल बालीलाई फूल तथा फल झर्ने र पछि गएर फल फुट्ने समस्याबाट जोगाउन आवश्यकता अनुसार सुक्ष्म खाद्यतत्व र सिँचाई दिनुहोस्।
- सुन्तलाजातको फलफूल बालीहरुमा पात खन्ने कीराको नोक्सानी कम गर्न ४ भाग पानीमा गाईको गहुँत वा निमको पातको झोल १ भाग मिसाई ५ दिनको फरकमा ३ पटक छर्नुहोस्। साथै व्यवसायिक खेती गर्ने कृषकहरुले रोगर ३०% ई.सी., २ एम.एल. प्रति लिटर पानीमा घोलेर ७ दिनको फरकमा ३ पटक छर्नुहोस्।
- आँपको बगैंचामा मधुवा लाग्ने समय भएकोले यसको नियमित अनुगमन गर्नुहोस्। यो कीराको अत्याधिक प्रकोप देखिएमा इमिडाक्लोप्रिड १७.८ एस.एल., १ एम.एल. ३ लिटर पानीमा मिसाई बेलुकीपख छर्नुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीमा पात खन्ने कीरा (लिफ माईनर) बाट हुने क्षति कम गर्न पुरानो पातहरु हटाउनुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीमा रातो खपटे कीराका लार्भाहरु जमीनको सतह भन्दा अलिकति मुनी बस्ने भएकोले समय-समयमा गोडमेल गर्नुहोस्। कीराले विहान र बेलुका नोक्सानी पुर्याउने भएकोले सम्भव भएसम्म टिपेर नष्ट गर्नुहोस्। प्रकोप धेरै भएमा साँझपख साईपरमेथ्रिन (१०% ई.सी.) २ एम.एल. प्रति लिटर पानीमा मिसाएर माटो र बोट भिज्नेगरि छर्नुहोस्।
- जुकेनी फर्सी (स्क्वास), काँक्रो, करेला, घिरौँला, लौका तथा मुन्टा खाने फर्सीको लागि सिफारिस दूरीमा मलखाद प्रयोग गरि विरुवा लगाउनुहोस्।
- बेर्ना सोरेको तरकारी बालीहरुमा रिङ्ग बनाई १०-१५ ग्राम युरिया प्रति बोटको दरले टपड्रेस गर्नुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीलाई फल कुहाउने औँसाबाट जोगाउन क्यु ल्युर युक्त बोटल ट्रयाप प्रति हेक्टर ८ वटाको दरले राख्नुहोस्।
- गाई, भैसी, भेडा, बाख्रामा खोरेत रोग र सुँगुर, बंगुर, बँदेलमा क्लासिकल स्वाइन फिभर रोग विरुद्द खोप लगाउनुहोस्।
- गर्मी मौसममा कुखुराले चाँडो-चाँडो सास फेर्ने, पानी धेरै खाने, दाना कम खाने, पखेटा र खुट्टा फालेर बस्ने, अण्डा उत्पादनमा कमी आउने, खोरमा कुखराहरुको मृत्यु हुने आदी भएमा पर्याप्त भेन्टीलेसन प्रदान गर्ने, कुखुराको घनत्व कम गर्ने, दिँउसो १२-३ बजे सम्म दाना नदिने, पर्याप्त मात्रामा सफा, चिसो पानीको व्यवस्था गर्नुहोस्। साथै, इलेक्ट्रोलाईट र मल्टी भिटामीन पानीमा राखेर दिनुहोस्।
- तराईका जिल्लाहरुमा टिलापिया माछाको प्रजनन समय भएको हुँदा एक लिंगीय टिलापिया उत्पादक ह्याचरी कृषकहरूले आवश्यक टिलापिया ब्रुड (२००-३०० ग्राम) छनौट गरेर प्रजनन पोखरीमा हापामा सेटिंग गरि प्रति वर्ग मिटर तीन माछाका दरले स्टक गर्नुहोस् र हप्ता दिनको अन्तरालमा ब्रुड माछाको मुख चेक गर्नुहोस्।
- यस समयमा नर्सिङ्ग पोखरीमा ब्याक स्विमर कीराले माछा भुरामा क्षति पुर्याउने हुँदा १.५ कट्ठा भुरा हुर्काउने पोखरीमा ८ लिटर डिजेल, २ लिटर डढेको मोबिल र ५०० ग्राम सरफ मिसाई बनेको घोलेलाई हावा नचलेको बेला बिहानीपख चारै कुनामा पर्नेगरि छर्कनुहोस्। तत्पश्चात ४-५ घण्टा सो पानीको सतहलाई नचलाउनुहोस्।
- कृषि र पशु सम्वन्धी जिज्ञासाको लागि पैसा नलाग्ने नार्कको फोन नम्बर-११३५ मा हरेक सोमबार दिँउसो २ देखि ४ बजेसम्म फोन गर्नुहोस्।
- कृषि-मौसम सल्लाह बुलेटिन नेपाल टेलिभिजनको NTV NEWS Channel बाट प्रत्येक शनिबार बेलुका ८ बजेको समाचारपछि प्रसारण हुने गर्दछ। यसको पुन: प्रसारण आईतबार बिहान ७ बजेको समाचारपछि पनि हेर्न सकिन्छ।

गत हप्ता (२५ चैत, २०७८ – १ वैशाख, २०७९) को मौसमी सारांश



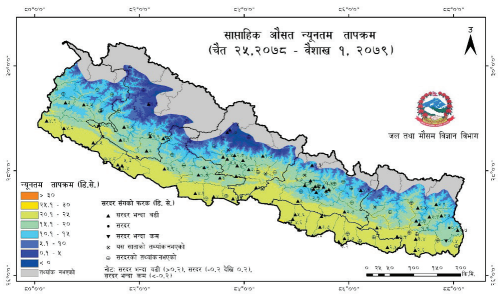
साप्ताहिक वर्षा: ७५ वटा मौसम केन्द्रहरुमा मापन गरिएको साप्ताहिक कुल वर्षाको तथ्याङ्क अनुसार गत साता तराईका केही भू-भागहरु बाहेकका अन्य धेरैजसो भू-भागहरुमा वर्षा मापन भएको छ । वर्षा मापन भएका अधिकांश केन्द्रहरुमा सरदर भन्दा कम वर्षा मापन गरिएको छ । प्रदेश नं-१, बागमती र गण्डकी प्रदेशको धेरैजसो भू-भागहरुमा १०.० मि.मी भन्दा बढी वर्षा मापन भएको छ । बर्षा मापन भएका केन्द्रहरु मध्ये सबैभन्दा बढी गण्डकी प्रदेशको लमजुङ जिल्लामा रहेको खैरीनिटार केन्द्रमा ९६.३ मि.मि. वर्षा मापन भएको छ ।

नक्साको पृष्ठभूमिमा देखाईएको रंगले साप्ताहिक कुल वर्षा जनाउँछ । त्रिभुजाकार तथा गोलाकार संकेतले केन्द्रमा मापन गरिएको वर्षालाई साप्ताहिक सरदर वर्षासँगको तुलनात्मक तथ्यांकमा देखाउँछ ।



साप्ताहिक अधिकतम तापक्रम: ११० वटा मौसम केन्द्रहरुमा मापन गरिएको साप्ताहिक औसत अधिकतम तापक्रमको तथ्याङ्क अनुसार गत साता देशका धेरैजसो केन्द्रहरुमा सरदर भन्दा बढी तापक्रम मापन भएको छ । देशको केही उच्च पहाडी भू-भागहरु बाहेकका अन्य अधिकांश भू-भागहरुमा 25.0 डि.से. भन्दा बढी तथा सुदुर पश्चिम, लुम्बिनी, गण्डकी प्रदेशका तराईका धेरैजसो भू-भागहरुमा र मधेश प्रदेश लगायत बागमती प्रदेशको तराईको केही भू-भागहरुमा ३५.० डि.से. भन्दा बढी तापक्रम मापन गरिएको छ । लुम्बिनी प्रदेशको बाँके जिल्लामा रहेको नेपालगंज (क्षेत्रिय कार्यालय) केन्द्रमा सबैभन्दा बढी ३८.१ डि.से. तापक्रम मापन भएको छ ।

नक्साको पृष्ठभूमिमा देखाईएको रंगले साप्ताहिक औसत अधिकतम तापक्रम (डि.से.) जनाउँछ । त्रिभुजाकार तथा गोलाकार संकेतले केन्द्रमा मापन गरिएको तापक्रमलाई साप्ताहिक सरदर तापक्रमसँगको फरकमा देखाउँछ ।



साप्ताहिक न्यूनतम तापक्रम: ११० वटा मौसम केन्द्रहरुमा मापन गरिएको साप्ताहिक औसत न्यूनतम तापक्रमको तथ्याङ्क अनुसार गत साता देशको अधिकांश केन्द्रहरुमा सरदर भन्दा बढी तापक्रम मापन भएको छ । तराईका अधिकांश भू-भागहरुमा २०.० डि.से. भन्दा बढी र अन्य भू-भागहरुमा २०.० डि.से. भन्दा कम साथै उच्च पहाडी भू-भागका केही स्थानहरुमा ५.० डि.से. भन्दा कम तापक्रम मापन गरिएको छ । गण्डकी प्रदेशको मनाङ जिल्लामा रहेको हुम्दे केन्द्रमा सबैभन्दा कम १.८ डि.से. तापक्रम मापन भएको छ ।

नक्साको पृष्ठभूमिमा देखाईएको रंगले साप्ताहिक औसत न्यूनतम तापक्रम (डि.से.) जनाउँछ । त्रिभुजाकार तथा गोलाकार संकेतले केन्द्रमा मापन गरिएको तापक्रमलाई साप्ताहिक सरदर तापक्रमसँगको फरकमा देखाउँछ ।

नोट: *(क) सरदर वर्षा भन्नाले सन् १९९१ देखि २०२० सम्मको सम्बन्धित हप्ताको औसतमा १० प्रतिशत भन्दा कम देखि १० प्रतिशत भन्दा बढीको वर्षालाई जनाउँछ ।*

(ख) सरदर अधिकतम/न्यूनतम तापक्रम भन्नाले सन् १९९१ देखि २०२० सम्मको सम्बन्धित हप्ताको औसतमा ०.२ डि.से. भन्दा कम देखि ०.२ डि.से. भन्दा बढीको तापक्रमलाई जनाउँछ ।

(ग) वर्षा र न्यूनतम तापक्रमको अवधि गत साताको शुक्रवार देखि विहिवारसम्म र अधिकतम तापक्रमको अवधि गत साताको बिहिवार देखि बुधवार सम्मको तथ्याङ्कलाई लिएर नक्सा तयार गरिएको छ ।

आगामी साता (२-८ वैशाख, २०७९) को मौसमी परिदृष्य							
प्रदेश	**भौगोलिक क्षेत्र**	**वर्षा / हिमपात**	**अधिकतम तापक्रम**	**न्यूनतम तापक्रम**	**बदली हुने अवस्था (सफा,आंशिक, सामान्य, पूर्ण)**	**महत्वपूर्ण मौसम (मेघगर्जन, असिना, कुहिरो)**	**कैफियत (मौसम प्रणाली)**
प्रदेश नं १	हिमाल/ उच्च पहाड	हल्का वर्षा /हिमपात	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक बदली। साताको अन्त्यमा सामान्य देखि पूर्ण बदली।		साताको शुरु र मध्यमा थोरै र साताको अन्त्यमा केही स्थानहरूमा हल्का वर्षा/ हिमपातको संभावना
	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक बदली साताको अन्त्यमा सामान्य देखि पूर्ण बदली	मेघगर्जन/ चट्याङ्ग	साताको शुरु र मध्यमा थोरै र साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन/ चट्याङ्ग सहित हल्का वर्षाको संभावना
	तराई	हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरूमा आंशिक बदली देखि सामान्यतया सफा रही साताको मध्य र अन्त्यमा आंशिक देखि सामान्य बदली	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन / चट्याङ्ग सहित हल्का वर्षाको संभावना
मधेश प्रदेश	तराई	हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरूमा आंशिक बदली देखि सामान्यतया सफा रहि साताको मध्य र अन्त्यमा आंशिक देखि सामान्य बदली	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन / चट्याङ्ग सहित हल्का वर्षाको संभावना
वागमती प्रदेश	हिमाल/ उच्च पहाड	हल्का वर्षा /हिमपात	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र अन्त्यमा सामान्य देखि पूर्ण बदली साताको मध्यमा आंशिक देखि सामान्य बदली।		साताको शुरु र अन्त्यमा केही स्थानमा र साताको मध्यमा एक-दुई स्थानहरूमा हल्का वर्षा/हिमपातको संभावना
	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक देखि सामान्य बदली। साताको अन्त्यमा सामान्य देखि पूर्ण बदली।	मेघगर्जन/ चट्याङ्ग	साताको शुरु र मध्यमा एक-दुई र साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन/चट्याङ्ग सहित हल्का वर्षाको संभावना
	तराई	हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरु र मध्यमा आंशिक बदली देखि सामान्यतया सफा रहि साताको अन्त्यमा सामान्य बदली	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन / चट्याङ्ग सहित हल्का वर्षाको संभावना
गण्डकी प्रदेश	हिमाल/ उच्च पहाड	हल्का वर्षा /हिमपात	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र अन्त्यमा सामान्य देखि पूर्ण बदली साताको मध्यमा आंशिक देखि सामान्य बदली।		साताको शुरु र अन्त्यमा केही स्थानमा र साताको मध्यमा एक-दुई स्थानहरूमा हल्का वर्षा / हिमपातको संभावना
	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक देखि सामान्य बदली। साताको अन्त्यमा सामान्य देखि पूर्ण बदली।	मेघगर्जन/ चट्याङ्ग	साताको शुरु र मध्यमा एक-दुई र साताको अन्त्यमा केही स्थानहरूमा मेघगर्जन/ चट्याङ्ग सहित हल्का वर्षाको संभावना
	तराई	छिटपुट देखि हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरु र मध्यमा आंशिक बदली देखि सामान्यतया सफा रहि साताको अन्त्यमा सामान्य बदली।	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा एक-दुई स्थानमा मेघगर्जन / चट्याङ्ग सहित छिटपुट देखि हल्का वर्षाको संभावना

प्रदेश	भौगोलिक क्षेत्र	वर्षा / हिमपात	अधिकतम तापक्रम	न्यूनतम तापक्रम	बदली हुने अवस्था (सफा,आंशिक, सामान्य, पूर्ण)	महत्वपूर्ण मौसम (मेघगर्जन, असिना, कुहिरो)	कैफियत (मौसम प्रणाली)
लुम्बिनी प्रदेश	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र अन्त्यमा आंशिक देखि सामान्य बदली। साताको अन्त्यमा आंशिक बदली।	मेघगर्जन/ चट्याङ्ग	साताको शुरु र अन्त्यमा एक-दुई स्थानहरूमा मेघगर्जन / चट्याङ्ग सहित हल्का वर्षाको संभावना
	तराई	छिटपुट देखि हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरु र मध्यमा आंशिक बदली देखि सामान्यतया सफा रहि साताको अन्त्यमा आंशिक बदली।	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा एक-दुई स्थानमा मेघगर्जन/चट्याङ्ग सहित छिटपुट देखि हल्का वर्षाको संभावना
कर्णाली प्रदेश	हिमाल/ उच्च पहाड	हल्का वर्षा /हिमपात	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र अन्त्यमा आंशिक देखि सामान्य बदली। साताको मध्यमा आंशिक बदली।		साताको शुरु र अन्त्यमा थोरै स्थानहरूमा हल्का हिमपातको संभावना
	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक बदली। साताको अन्त्यमा आंशिक देखि सामान्य बदली।	मेघगर्जन/ चट्याङ्ग	साताको शुरु र अन्त्यमा एक-दुई स्थानहरूमा मेघगर्जन/ चट्याङ्ग सहित हल्का वर्षाको संभावना
सुदूर पश्चिम प्रदेश	हिमाल/ उच्च पहाड	हल्का हिमपात	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र अन्त्यमा आंशिक देखि सामान्य बदली। साताको मध्यमा आंशिक बदली ।		साताको शुरु र अन्त्यमा थोरै स्थानहरूमा हल्का हिमपातको संभावना
	पहाड	हल्का वर्षा	उल्लेखनीय परिवर्तन नहुने	उल्लेखनीय परिवर्तन नहुने	साताको शुरु र मध्यमा आंशिक बदली। साताको अन्त्यमा आंशिक देखि सामान्य बदली।	मेघगर्जन/ चट्याङ्ग	साताको शुरु र अन्त्यमा एक-दुई स्थानहरूमा मेघगर्जन/चट्याङ्ग सहित हल्का वर्षाको संभावना
	तराई	छिटपुट देखि हल्का वर्षा	हल्का बढ्ने	हल्का बढ्ने	साताको शुरु र मध्यमा आंशिक बदली देखि सामान्यतया सफा रहि साताको अन्त्यमा आंशिक बदली।	मेघगर्जन/ चट्याङ्ग	साताको अन्त्यमा एक-दुई स्थानमा मेघगर्जन/चट्याङ्ग सहित छिटपुट देखि हल्का वर्षाको संभावना

नोटः साताको शुरुले शुक्रबार र शनिबार, साताको मध्यले आइतबार, सोमबार र मंगलबार तथा साताको अन्त्यले बुधबार र बिहीबारलाई जनाउँछ । मौसम पूर्वानुमान सम्बन्धी विस्तृत जानकारीको लागि हरेक दिन बिहान ६ बजे र बेलुका ६ बजे अध्यावधिक हुने महाशाखाको वेबसाइट http://www.mfd.gov.np हेर्नुहोस् ।

कृषि सल्लाह

खाद्यान्नबाली

- जुम्ला लगायतका उच्च पहाडी क्षेत्रमा वर्षे धानको ब्याड राख्ने समय भएकोले लेकाली धान-१, लेकाली धान-३, चन्दननाथ-१ र चन्दननाथ-३ मध्ये उपलब्ध जातको बीउ २.५ के.जी .प्रति रोपनीका दरले व्यवस्था गर्नुहोस् ।
- चैते धान रोपेको करीब २५-३० दिनपछि अथवा बिरुवाले गाँज हाल्न शुरु गरेपछि ४.४ के.जी. युरिया प्रति रोपनी वा २.९ के.जी. युरिया प्रति कट्ठाका दरले टपड्रेस गर्नुहोस् । टपड्रेस गरिसकेपछि २४ घण्टासम्म खेतबाट पानी बगेर बाहिर जान नदिनुहोस् ।
- चैते धानमा झारपात व्यवस्थापनको लागि झारनाशक विषादी बिस्पाएरिबेक (Bispyribac 10 EC), २५ लिटर पानीमा १२.५ मिलिलिटरको दरले मिसाएर प्रति रोपनीमा अथवा १७ लिटर पानीमा ८.३ मिलिलिटरको दरले मिसाएर प्रति कट्ठामा धान रोपेको १५ देखि २५ दिनभित्र खेतमा छिपछिपे पानी भएको अवस्थामा फ्लेट फेन नोजलले स्प्रे गर्नुहोस् । पछि झार आएमा ४०-५० दिनभित्र एकपटक हातले गोड्नुहोस् ।


चित्र: धान गोड्ने कोनो वीडर

- मेसिनबाट (राईस ट्रान्सप्लान्टर) लाईनमा लगाईएको चैते धान गोडमेल गर्न कोनो वीडर प्रयोग गर्नुहोस् । यस मेसिनको प्रयोगले ४-५ घन्टामा १ रोपनी धान गोडमेल गर्न सकिन्छ ।
- चैते धानमा गवारो कीराले आर्थिक क्षती गर्ने भएकोले यसको व्यवस्थापन गर्न फिप्रोनिल (Fipronil 0.3%G) अथवा क्लोरपाईरिफस ४% जी. १० के.जी. प्रति हेक्टरको दरले पानी नपरेको समयमा साँझपख छर्नुहोस् ।
- वर्षे धानबालीवाट राम्रो उत्पादन लिन र आफुले लगाउन चाहेको ठाँउ अनुसारको लागि सिफारिस गरिएका धानका उन्नत जातहरुको बीउ भरपर्दो श्रोतबाट समयमा नै व्यवस्था गर्नुहोस् ।
  - तराई ,भित्रि मधेस, तल्लो पहाडी बेंशीका सिंचित क्षेत्रको लागि बहुगुणी धान-१, बहुगुणी धान-२, हर्दिनाथ-३, मिथिला, रामपुर मन्सुली, सावित्री, रामधान तथा असिंचित क्षेत्रको लागि सुख्खा धान-१, सुख्खा धान-२, सुख्खा धान-३, सुख्खा धान-४, सुख्खा धान-५, सुख्खा धान-६, तरहरा-१ र हर्दिनाथ-२
  - घैया धानको लागि घैया-१, घैया-२ र विन्देश्वरी
  - बाढीग्रस्त क्षेत्रका लागि स्वर्ण सब-१ र सम्बा मन्सुली सब-१
  - मध्यपहाडी क्षेत्रका लागि खुमल-४, खुमल-८, खुमल-१०, खुमल-११ र खुमल-१३
- छरुवा धानखेतीको लागि तराई तथा भित्री मधेसमा सुख्खा धान-१, सुख्खा धान-२, सुख्खा धान-३, तरहरा-१, हर्दिनाथ-२, घैया-२, राधा-४ र विन्देश्वरी तथा मध्य पहाडमा खुमल-४, खुमल-८ र खुमल-१०
- वर्षायाममा मध्यपहाडी क्षेत्रमा लगाईने मकैको सिफारिस जातहरु मनकामना-१, मनकामना-३, मनकामना-४, मनकामना-५, मनकामना-६, पोषिलो मकै-१, खुमल पहेंलो, सितला, देउती, खुमल हाइब्रिड-२ (बर्णशंकर

मकै) आदि तथा छिटो पाक्ने मकैका जातहरु अरुण-३, अरुण-४, अरुण-६ र उच्च पहाडी क्षेत्रका लागि गणेश-१, गणेश-२ छर्नुहोस्।

- पहाडी भेगहरुमा सिफारिस गरिएको मकैको उन्नत जातहरु १-१.५ के.जी. प्रति रोपनीका दरले लगाउनुहोस्।
- वर्षे मकै लगाउन जग्गा तयारीको बेला ७५० के.जी कम्पोष्ट; २.९ के.जी. युरिया; ६.५ के.जी. डि.ए.पी.; ५ के.जी. म्यूरेट अफ पोटास र १.३ के.जी. जिङ्क सल्फेट प्रति रोपनीका दरले अथवा ५०० के.जी कम्पोष्ट; १.९ के.जी. युरिया; ४.४ के.जी. डि.ए.पी.; ३.३ के.जी. म्यूरेट अफ पोटास र ०.८ के.जी. जिङ्क सल्फेट प्रति कट्ठाका दरले माटोमा राम्ररी मिलाउनुहोस्। बर्णशंकर जातको लागि भने युरिया ५.१ के.जी. प्रति रोपनी अथवा ३.४ के.जी. प्रति कट्ठाका दरले प्रयोग गर्नुहोस्।
- मकैमा अमेरिकी फौजी कीरा (Spodoptera frugiperda) को प्रकोप देखिएकोले नियमित अनुगमन गर्नुहोस्। कीराको संख्या तथा क्षतिको आँकलन गर्न वयस्कको लागि बत्ति र फेरोमन पासोको तथा लार्भाको लागि खाल्डे पासोको प्रयोग गर्नुहोस्। प्रकोप ज्यादा भएमा नोक्सानी कम गर्न इमामेक्टिन बेन्जोएट ५% एस.जी., ०.४ ग्राम वा स्पिनोस्याड ४५% एस.सी., ०.३ मिलिलिटर वा स्पाइनेटोराम ११.७% एस.सी., ०.५ मिलिलिटर प्रति लिटर पानीको दरले बोट भिज्नेगरि ७ दिनको फरकमा २-३ पटक छर्नुहोस्। एउटै विषादी निरन्तर प्रयोग नगरि आलोपालो गरि प्रयोग गर्नुहोस् तथा घोगा लागिसकेपछि विषादी प्रयोग नगर्नुहोस्।

साना आकारका लार्भाले गरेको क्षतिको लक्षण

मध्यम आकारका लार्भाले गरेको क्षतिको लक्षण

गुभोमा लार्भाले गरेको क्षतिको लक्षण

कीराको फुल अवस्था

कीराको लार्भा अवस्था (क्षति गर्ने अवस्था)

वयस्क पोथी पुतली

- पाकेको गहुँबाली तथा मुसुरोबाली मौसमको अवस्था हेरि भित्र्याउनुहोस्।
- गहुँलाई २-३ दिन घाममा सुकाएपछि (दानामा चिस्यानको मात्रा १०-१२ प्रतिशत) हावा नछिर्ने भाँडा जस्तै- सीड बिन, प्रो ब्याग, घ्याम्पो आदीमा भण्डारण गर्नुहोस्।
- खाद्यान्नको लागि प्रयोग गरिने गहुँ भण्डारणमा कीराबाट जोगाउन भकारीको माथिल्लो भागमा ४-५ ईन्च जति छहारीमा सुकाएको सुकिलो नीम, बकाइनो र तितेपाती जस्ता विरुवाको पातहरु प्रयोग गर्नुहोस्।
- साथै बीउको लागि प्रयोग गरिने गहुँ भण्डारणमा कीरा लाग्न नदिन सेलफस विषादी १ पुरिया प्रति मेट्रिक टन (१० क्विन्टल) भण्डारण गरेको बीउमा ६-१२ ईन्च भित्र हावा नछिर्ने गरि बन्द गरि राख्नुहोस्।

- मुंग लगाउनु हुने कृषकहरुले कल्याण, प्रतिक्षा र प्रतिज्ञा मध्ये उपलब्ध जातको बीउलाई राइजोबियम जीवाणुले उपचार गरी १-१.५ के.जी. बीउ प्रति कट्ठाका दरले छर्नुहोस्।

फलफूल बाली

- सामान्य भण्डारमा राखिएका फलफूल तथा तरकारीलाई पानी वाष्पिकरण भई बिग्रनबाट जोगाउन भण्डार घर वरिपरि पानी छर्केर आवश्यक ओसको व्यवस्था गर्नुहोस्।
- सुख्खा मौसम (तापक्रम बढ्दै जाने तथा सापेक्षित आर्द्रता घट्दै जाने भएकोले) रहेकोले सबै किसिमका फलफूल बालीलाई फूल तथा फल झर्ने र पछि गएर फल फुट्ने समस्याबाट जोगाउन आवश्यकता अनुसार सुक्ष्म खाद्यतत्व र सिँचाई दिनुहोस्।
- कागती, आँप, लिची खेती गर्नु भएका कृषकले केराउगेडे फल भएपछि प्लान्टोप्लेक्स नामक हर्मोन सिफारीस मात्रामा छरेमा फल झर्ने समस्या कम हुन्छ।
- सुख्खा मौसमको असरबाट जोगाउन यसै वर्ष सार्नु भएको केरा, कागती, आँप, लिची, स्याउ आदिमा माटोको चिस्यानको अवस्था हेरी सिँचाई गर्नुहोस्।
- आँपको बगैंचामा मधुवा (Mango hopper) लाग्ने समय भएकोले यसको नियमित अनुगमन गर्नुहोस्। यो कीराको अत्याधिक प्रकोप देखिएमा *इमिडाक्लोप्रिड* १७.८ एस.एल., १ एम.एल. ३ लिटर पानीमा मिसाई बेलुकीपख छर्नुहोस्।
- आँपको फल कुहाउने औँसाले फल गुच्चा आकारको भएको अवस्थादेखि प्वाल पारेर फलभित्र अण्डा पारि माथिबाट बन्द गरिदिन्छ र औंसा बन्दछ। सोहि औंसाले फल खाएको ठाउँमा संक्रमण सुरु भई फल कुहेर झर्दछ। यसको लागि भाले झिँगा आकर्षण गर्न फेरोमेन ट्राप (मिथाइल युजिनोल) २-३ वटा प्रति कट्ठा राख्नुहोस्। २० लिटर पानीमा ४ लिटर मोलासेस र ५ एम.एल. स्पिनोस्याड मिसाई बगैँचामा छर्कनुहोस्। साथै कुहेर झरेको फललाई खाडलमा पुर्नुहोस्।
- आँपको कोयामा लाग्ने घुनको प्रकोप हुने बगैँचाहरुमा थायोमेथोक्जाम २५% डब्ल्यु. जी. ०.५ ग्राम प्रति लिटर पानीमा घोलेर बोटको हाँगाहरु र हाँगाको कापमा १५ दिनको फरकमा ३ पटक (फूल फुल्नु पहिला, फुल झरिसकेपछि र फल केराउ/लप्सी दाना जत्रो भएको अवस्थामा) बेलुकीपख छर्नुहोस्।


चित्र: लिचीमा सुलसुलेको प्रकोप

- लिची बगैंचामा सुलसुले (Mite) को प्रकोप हुने भएकोले यसको नियमित अनुगमन गर्नुहोस्। प्रकोप ज्यादा

भएमा स्पाईरोमेसिफेन २२.९% एस. सी. १ एम.एल. प्रति लिटर पानीमा घोलेर ७-१० दिनको फरकमा २-३ पटक छर्नुहोस् ।

- सुख्खा मौसममा लिची रष्टको प्रकोप हुने भएकोले १०-१५ दिनको फरकमा सिँचाइको व्यवस्था गर्नुहोस् । कपरअक्सिक्लोराइड ३ ग्राम प्रति लिटर पानीमा घोलेर पात भिज्नेगरि १५ दिनको फरकमा २-३ पटक छर्नुहोस् ।
- केरा खेती गर्ने कृषकहरुले विलियम हाइब्रिड, झापाली मालभोग, हरिछाल, रोबष्टा आदि उन्नत जातहरु रोप्नुहोस् ।
- तापक्रम बढ्दै जाने क्रम भएकोले केरामा गवारो तथा घुन कीराले नोक्सानी गर्न सक्छ, यसको प्रकोप कम पार्न बगैँचाको सरसफाई गर्ने, एउटा गाँजमा ३ वटा सम्म मात्र बोट राख्ने र प्रत्येक गाँजमा क्लोरपाइरीफस ४% जी.आर., ३० ग्राम गाँजको वरिपरि रिङ आकारमा कुलेसो बनाई माटोमा राम्रोसँग मिलाईदिनुहोस् ।
- केराको वोट ओइलाउने (पानामा रोग) देखिएमा रोग लागेको बोटविरुवा उखेलेर हटाउने, नयाँ विरुवा सार्नको लागि रोग नलागेको क्षेत्रबाट ल्याउने तथा कार्बेन्डाजिम (बेभीष्टिन) १ लिटर पानीमा २ ग्राम घोली बोटको फेद भिजाउने तथा पातमा छर्नुहोस् । वा कपर अक्सिक्लोराइड २ ग्राम प्रति लिटर पानीमा घोली बोट र जरा भिज्नेगरि छर्नुहोस् ।




- हावाहुरीबाट हुने क्षति नियन्त्रण गर्न पसाएका केराको बोटहरुलाई टेको दिनुहोस् ।
- केरामा लाग्ने पात डढुवा रोग ब्यवस्थापनको लागि रोगी पातहरु संकलन गरि खाल्डोमा पुरी दिनुहोस् साथै २ ग्राम मेन्कोजेब युक्त विषादी प्रति लिटर पानीमा मिसाई सम्पूर्ण पात भिज्नेगरी छर्कनुहोस् ।
- अनारमा लाग्ने पुतलीको कारणले फल झर्ने र कुहिने समस्या हुने हुँदा फूल फुलेदेखि फल तयार हुने बेलासम्म यस समस्याको समाधानका लागि यसै हप्ता देखि एकिकृत व्यवस्थापन विधि अपनाउनुहोस् । नीमजन्य विषादी ०.३ ई.सी., ५ एम.एल. प्रति लिटर पानीमा घोली १५ दिनको फरकमा ४ पटकसम्म छर्नुहोस् । प्रकोप अधिक देखिएमा बगैँचाहरुमा साईपरमेथ्रिन (१०% ई.सी.) २ एम. एल. प्रति लिटर पानीमा घोली १५ दिनको फरकमा ३ पटकसम्म छर्कनुहोस् ।
- पहाडी जिल्लाहरुको सुन्तला बगैचामा बोरोन, जिंक, फलाम र म्याङ्गनिजको कमी भएको पाइएकोले सुन्तलामा पालुवा आइरहेको बेला र दाना लागिसकेपछि २ पटक एग्रोमिन वा मल्टिप्लेक्स ४० थोपा प्रति लिटर पानीमा घोली पात लपक्क भिज्नेगरी विषादी छर्ने स्प्रेयरको सहायताले छर्नुहोस् । यसरी छर्ने काम यसै हप्ता देखि बैशाख/जेष्ठसम्म पानी नपरेको समय पारेर छर्न सकिन्छ ।
- तापक्रम बढ्दै जाँदा सुन्तलाजात फलफूलको डाँठमा प्वाल पार्ने गवारो, पात खन्ने कीरा, पुतलीको लार्भा (lemon butterfly) र कत्ले कीराको प्रकोप बढ्न सक्ने भएकोले बगैँचा निरीक्षण गरी नियन्त्रणका उपाय अपनाउनुहोस् ।

चित्र: सुन्तलाको पात खन्ने कीरा

चित्र: सुन्तलाजात फलफूलको पुतली

चित्र: सुन्तलाजात फलफूलको कत्ले कीरा

- सुन्तलाजातको फलफूल बालीहरुमा पात खन्ने (Leaf miner) कीराको नोक्सानी कम गर्न ४ भाग पानीमा गाईको गहुँत वा निमको पातको झोल १ भाग मिसाई ५ दिनको फरकमा ३ पटक छर्नुहोस्। साथै व्यवसायिक खेती गर्ने कृषकहरुले रोगर ३०% ई.सी., २ एम.एल. प्रति लिटर पानीमा घोलेर ७ दिनको फरकमा ३ पटक छर्नुहोस्।
- कागतीका बोटहरुमा कत्ले कीरा, पतेरो, नयाँ पालुवामा लाग्ने लाही, पात खाने लाभ्रे, सुलसुले आदि बढी आउन सक्ने भएकोले पहिचान गरी नियन्त्रण गर्नुहोस्।
- कागती बगैंचामा क्यांकर रोगको व्यवस्थापनको लागि जीवाणुको संक्रमणबाट ग्रस्त सबै हाँगा, पातहरु हटाई मट्टितेलको प्रयोग गरी जलाई दिनुहोस्। बाँकी बोटलाई कपर अक्सिक्लोराईड ३ ग्राम र कासु वी (कासुगामाइसिन) १ ग्राम विषादी १० लिटर पानीमा मिसाई १५ दिनको फरकमा छर्नुहोस्।

बोटको विभिन्न भागमा देखिने क्यांकरका लक्षणहरु

शुरुवाती अवस्था डाँठमा पातमा फलमा

- वसन्त ऋतुको आगमनसँगै तापक्रमको वृद्दि हुने हुँदा विभिन्न लेकाली फलफूल बालीहरुमा पलाउने नयाँ पालुवाहरुमा लाही कीरा, सुलसुले, कत्ले कीरा जस्ता चुसाहा कीराहरुको प्रकोप बढ्ने भएकोले यिनिहरुको प्रकोप कम गर्न सर्वो तेल वा एट्सो खनिज तेल १५ एम.एल. प्रति लिटर पानीमा मिसाई १५ दिनको फरकमा छर्नुहोस्।
- स्याउमा लाग्ने भुवादार लाही कीराको व्यवस्थापनको लागि नियमीत अनुगमन गरि एकिकृत ब्यबस्थापन

बिधि अपनाउनुहोस् । लाही कीराबाट संक्रमित हाँगा, मुनाहरु नष्ट गर्नुहोस् । लजालु स्वभावका परजीवी खपटे कीराहरुले यसलाई नोक्सानी पुर्याउने भएकोले यसको संवर्धन गर्नुहोस्, परजिवी कीरा एफिलिनस माली (Aphelinus mali) को प्रयोग गर्नुहोस् । खनिज तेल (Mineral oil) १० एम.एल. प्रति लिटर पानीमा मिसाई भुवादार लाही लागेको स्थानमा भिज्नेगरि सात-सात दिनको अन्तरालमा तीनपटक छर्कनुहोस् ।

तरकारी बाली

- मध्यपहाडमा आलुको दानामा लाग्ने पुतलीले क्षति पुर्याउने हुँदा त्यसबाट जोगाउन १५ दिनको फरकमा माटो राम्ररी भिज्नेगरि सिँचाई दिने र आलुको दाना माटोमाथि निस्कन नदिन राम्ररी उकेरा दिनुहोस् ।
- मध्यपहाडमा डढुवा रोगको प्रकोप देखि सक्ने संभावना भएकोले रोगको व्यवस्थापनको लागि यो रोगको अनुकुल वातावरण रहीरहेमा मेन्कोजेवयुक्त कुनै पनि विषादी (इण्डोफिल एम-४५, डाइथेन एम-४५आदि) २.५ ग्राम प्रतिलिटर पानीमा घोलेर प्रतिकट्ठा ३० लिटरको दरले बोटको सम्पूर्ण भाग भिज्नेगरि ७ दिनको अन्तरमा ४-६ पटक छर्नुहोस् । प्रकोप बढ्दै गएमा डाइमेथोमर्फ (एक्रोबेट) वा फेनामिडन तथा मेन्कोजेव युक्त मिश्रित (सेक्टिन) १.५ ग्राम प्रति लिटर पानीका दरले १० दिनको अन्तरमा ३-४ पटक वा क्रिलाक्सिल एम.जेड. ७२% डब्लु.पि. को धुलो २ ग्राम प्रति लिटर पानीमा घोलेर ७ दिनको अन्तरमा ४-५ पटक छर्नुहोस् ।
- मध्यपहाडी क्षेत्रमा लगाएको आलुबालीमा लाही कीराको नियमित अनुगमन गर्नुहोस् ।
- मध्यहाडमा माघ महिनामा बीउका लागि लगाएको आलुबालीमा रगिंग गर्नुहोस् । रगिंग गर्दा भाईरस लागेका, रोगी, बेजातका, कमजोर र मसिना विरूवाहरू (दाना लागिसकेको भए उक्त दानाहरू समेत) उखेलेर हटाउनुहोस् ।
- मध्यपहाडमा माघ महिनामा लगाएको आलुबालीमा चिस्यानको अबस्था हेरी सिंचाई गर्नुहोस् ।
- पहाडी भेगका पाखो बारीमा रातो कमिलाको प्रकोप देखिने ठाँउहरूमा निरन्तर ओसिलो रहने गरी सिंचाईको ब्यवस्था गर्नुहोस् । प्रकोप बढी भएमा क्लोरोपाईरिफोस् २०% ई.सी. २ मिलिलिटर प्रतिलिटर पानीमा मिसाएर माटो भिज्नेगरी प्रयोग गर्नुहोस् ।
- मध्यपहाडी क्षेत्रमा सिमी र बोडी लगाउन लाईन देखि लाईनको दूरी १२० से.मी. र बोटदेखि बोटको दूरी २० से.मी. फरक गरि एउटा प्वालमा २ गेडा बीउ खसाल्नुहोस् ।
- सिमी बालीमा सिंदूरे रोग व्यवस्थापनको लागि शुरुवाती अवस्थामा प्रकोप देखिएका पातहरु हटाई जलाउने गर्नुहोस् । प्रकोप ज्यादा भएमा कपर अक्सिक्लोराईड ५०% डब्लु.पी. २ ग्राम वा सल्फर पाउडर ८०% डब्लु.पी. २ ग्राम प्रति लिटर पानीमा घोलेर बोट भिज्नेगरि छर्कनुहोस् ।
- भण्टाको डाँठ तथा फलको गबारो व्यवस्थापनको लागी गवारोको कारण ओईलएको मुन्टा, पात तथा फल टिपी करीव १ फुट गहिरो खाडलमा पुर्ने वा जलाउने गर्नुहोस् । क्लोरानट्रानिलिप्रोल (कोराजेन) १८.५ एस.सी., ०.२ एम.एल. प्रति लिटर पानीमा मिसाई साँझपख छर्नुहोस् ।
- बेर्ना सारेको तरकारी बालीहरुमा रिड्ग बनाई १०-१५ ग्राम युरिया प्रति बोटको दरले टपड्रेस गर्नुहोस् ।
- जुकेनी फर्सी (squash), काँक्रो, करेला, घिरौँला, लौका तथा मुन्टा खाने फर्सीको लागि तल उल्लेख गरे बमोजिमको दूरीमा खाडल खनी राम्रो पाकेको गोबर मल ५ के.जी., हड्डिको धुलो १०० ग्राम, पीना १०० ग्राम,

डि.ए.पी. ४० ग्राम, पोटास ४० ग्राम र बायोजाईम, जिङ्क, बोरेक्स प्रत्येक ३/३ ग्रामका दरले माटोमा मिसाई विरुवा लगाउनुहोस्।

लहरे बालीहरु	लाईन देखि लाईनको दूरी (मिटर)	बोटदेखि बोटको दूरी (मिटर)
जुकेनी फर्सी (squash)	१	१
काँक्रो	१.२	२
करेला	१.५	१
घिरौँला	२	१
लौका	२	१
मुन्टा खाने फर्सी (४-५ बोट प्रति खाडल)	२	२

चित्र: रातो खपटे कीरा

- कलिलो अवस्थामा भएको तरकारी बालीहरुमा (काउली समुह, बोडी, सिमी, भन्टा, भिंडी आदि) रातो खपटे कीरा र उफ्रने खपटे कीराले पातमा प्वालहरु पारी नोक्सानी पार्न सक्छ। सम्भव भएसम्म कीराहरु टिपेर नष्ट गर्नुहोस्। थोरै प्वालहरु भएमा खरानी वा गाईको गहुँत प्रयोग गर्नुहोस् तर धेरै क्षती भई आर्थिक नोक्सानी हुने अवस्था छ भने साईपरमेथ्रिन (१०% ई.सी.) २ एम. एल. प्रति लिटर पानीमा मिसाएर साँझपख छर्कनुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीमा १० ग्राम युरियाका दरले १५-२०, ४०-४५ र ६०-६५ दिनमा टपड्रेस गर्नुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीमा पात खन्ने कीरा (Leaf miner) बाट हुने क्षति कम गर्न पुरानो पातहरु हटाउनुहोस्।
- काँक्रो, फर्सी समुहको लहरे बालीलाई फल कुहाउने औँसाबाट जोगाउनको लागि क्यु ल्युर युक्त बोटल ट्र्याप प्रति हेक्टर ८ वटाको दरले राख्नुहोस्। यस्तै फलफूल बालीमा मिथायल इयुजिनल युक्त बोटल ट्र्याप प्रति कट्ठा १०-१२ ओटाको दरले राख्नुहोस्। साथै प्रत्येक २ हप्तामा नयाँ ल्युर युक्त बोटल फेर्नुहोस्। मालाथियन ५०% इ.सी., २ एम.एल. प्रति लिटर र २ ग्राम चिनी (भेली) पानीमा मिसाएर प्रति हेक्टर २०-२५ ठाँउमा फूल फुल्नु अगाडीदेखि १५-१५ दिनको फरकमा छर्नुहोस्।

- प्याज तथा काँक्रो, फर्सी समुहको लहरे बालीमा शीते ढुसी (Downy mildew) को व्यवस्थापनको लागि रोगी पातहरु हटाई मेन्कोजेवयुक्त विषादी २-२.५ ग्राम प्रति लिटर पानीमा मिसाई हरेक ८-१० दिनको अन्तरमा ३-४ पटक सम्पूर्ण बोट भिज्नेगरि छर्कनुहोस् । सिंचाई दिँदा स्प्रिङ्कल प्रयोग नगर्नुहोस् ।
- गोलभेँडामा पात खन्ने कीरा (Tuta absoluta) को अनुगमन गरि व्यवस्थापनका उचित विधिहरु अपनाउनुहोस् ।
- गोलभेंडामा लाग्ने गवारो (Fruit borer) कीरा व्यवस्थापनको लागी १० ग्राम भेली प्रति लिटर पानीमा मिसाई बनाएको घोलमा HaNPV (हेली एन.पि.भी.) २५० LE को १.५ एम.एल. हालेर साँझको समयमा स्प्रे गर्नुहोस्, अथवा व्याक्टेरियाजन्य (बी.टी.) Bt (डाईपेल, बायोलेप) ३ ग्राम प्रति लिटर पानीमा मिसाएर साँझको समयमा स्प्रे गर्नुहोस्, अथवा क्लोरानट्रानिलिप्रोल (कोराजेन) १८.५ इ.सि. ०.४ एम.एल. प्रति लिटर पानीमा मिसाई बोट भिज्नेगरि स्प्रे गर्नुहोस् । साथै कीराले नोक्सानी गरेका फलहरु संकलन गरी खाडलमा पुर्नुहोस् ।

गोलभेँडाको मोजाइक भाइरसको व्यवस्थापन विधिहरु

- गोलभेँडामा लाग्ने मोजाइक भाइरस सेतो झिँगाले सार्ने भएको हुँदा शुरुमा सेतो झिँगाको नियन्त्रण गर्नुहोस् । यसको लागि एसिटामाइप्रिड २०% एस. पि. ०.५ ग्राम प्रति लिटर पानीमा घोलेर स्प्रे गर्नुहोस् ।
- यदि मोजाइक भाइरस कम बोटमा मात्र देखिएको छ भने उक्त बोटहरुलाई उखेलेर जलाउने गर्नुहोस् र बाँकी बोटहरुमा भिरकोन एच १ एम.एल. प्रति लिटर पानीमा घोलेर हरेक हप्ताको अन्तरालमा ३-४ हप्तासम्म स्प्रे गर्नुहोस् ।
- धेरै क्षेत्रफलमा मोजाइक भाइरस लागेको छ भने सबै बोटहरुलाई उखेलेर जलाउनुहोस् ।

अन्य

- मौरी घारमा रोग, सुलसुले र रानु भए नभएको नियमित अवलोकन गर्नुहोस् । हाल मौरीको लागि उपयुक्त मौसम भएकोले घारको नियमित निरीक्षण गरी आधार चाकाहरु साथै सुपर (तल्ला) थप्ने व्यवस्था गर्नुहोस् । साथै घारको संख्या बढाउनु छ भने रानुको उपयुक्त व्यवस्था गरि मौरी गोला विभाजन गर्नुहोस् ।
- गोठेमल वा कम्पोष्ट मललाई खेतमा लगेपछि घाममा सुक्न दिने हो भने १२ घण्टा सुक्दा ६%, ३६ घण्टा सुक्दा २३% र ७ दिनसम्म सुक्दा ३६% नाइट्रोजन नोक्सान हुने भएकोले खेतवारीमा मल थुप्रो पारेर वा छिरलेर सुकाउनु हुँदैन, त्यसकारण जमीन जोतेर माटोमा मिलाउनुहोस् ।
- उखुबालीको नयाँ गुबोमा एक भन्दा बढि स-साना प्वालहरु देखिएमा टुसा पसाउने गवारो (Early shoot borer) को नोक्सानी हुनसक्छ । यसको प्रकोप कम गर्न उखु रोपेको ४५ र ६० दिनमा ३ ईन्च जति माटो चढाएर हल्का सिँचाई गर्नुहोस् । उखुको जात अनुसार ढिलो पाक्ने जातमा मृत गुबो १५ देखि २३% र छिटो पाक्ने जातमा १७% भन्दा बढी देखिएमा आर्थिक क्षती हुन सक्छ । यस्तो अवस्थामा थायोडीकार्प (Thiodicarp 75% WP) २.० ग्राम प्रति लिटर पानीको दरले ८००-१००० लिटर घोल तयार गरी प्रति हेक्टर बालीमा साँझपख छर्नुहोस् ।

अगौटे गवारोको वयस्क

अगौटे गवारोको लार्भा

अगौटे गवारोको अचल अवस्था

- उखुबालीमा क्षती पुर्याउने विभिन्न गवारो कीराहरुको व्यवस्थापनको लागि उखु रोपेको एक महिनापछि ट्राइकोग्रामा परजीवी कीरा १००,००० (१० x ५ से.मी. को पाँचवटा ट्राइको-कार्ड) प्रति हेक्टरका दरले १० दिनको अन्तरालमा ४-५ पटक छोड्नुहोस् (ट्राइको-कार्डको लागि नजिकको चिनी मिल वा कृषि सम्बन्धि कार्यालयहरुमा सम्पर्क गर्नुहोस्)।
- माघको दोश्रो हप्तादेखि फागुनको पहिलो हप्तासम्ममा लगाएको उखुबालीमा गोडमेल र सिँचाई गरि ४.४ के.जी. युरिया प्रति रोपनी वा २.९ के.जी. युरिया प्रति कठ्ठाको दरले बाली लगाएको ६०-७५ दिनमा पहिलो टपड्रेस गर्नुहोस्।
- माटोको सौर्य उपचार विधिबारे अनुसूची-३ मा विस्तृतमा दिईएको छ।

कफी बाली

- कफीमा फूल फुल्ने समय भएकोले सिँचाईको व्यवस्था गर्नुहोस्। सिंचाई छैन भने बोटको वरिपरि छापो राख्नुहोस्। कफी बगैँचामा जमिन ढाक्ने बालीहरु जस्तै-कोसेबाली (भटमास, बोडी, घ्यू सिमी आदि) र बगैचा ४ वर्ष पुगेको छैन भने अदुवा, वेसार (हलेदो), बदाम, ढैंचा लगाउनुहोस्।
- प्रांगारिक मल, झोल मल र वानस्पतिक विषादीको आवश्यकता अनुसार प्रयोग गर्नुहोस्।
- नर्सरीमा टोपे अवस्थामा आएका बेर्नालाई बालुवा, मल र माटो क्रमश: एक, दुई र तीन भागको मिश्रणलाई ५ x ७ इन्च वा ६ x ८ इन्चको पोली ब्यागमा भरेर बिरुवा सार्नुहोस्।
- कफीको सेतो गबारोले फुल पार्ने समय भएकोले व्यवस्थापनको लागि १०% को बोर्डो मिश्रणको लेप बनाएर काण्डमा लगाउनुहोस्।
- सिन्दुरे रोगको लक्षण देखिएमा बढी भएको छहारी हटाउनुहोस्। रोग लागेका हाँगा र पातहरु काटेर जलाउनुहोस्।
- कफीबालीमा कोत्रे रोग देखिएमा कपर अक्सिक्लोराइड २ ग्राम प्रति लिटर पानीको दरले १०-१२ दिनको फरकमा २-३ पटक सम्पूर्ण बोट भिज्नेगरि छर्केर उपचार गर्नुहोस्।

पशुपालन

गाई, भैँसी, भेडा, बाख्रा

- तापक्रम बढ्दै जाँदा पशुवस्तुमा बाह्य परिजिवीहरु जस्तै-किर्ना, लुतो भए नभएको निरिक्षण गर्नुहोस्। किर्ना देखिएमा निम्न घरेलु उपचार बिधि अपनाउनुहोस्।
- २०० ग्राम नुन, ४ लिटर पानीमा घोलेर यसै झोलले नुहाईदिनुहोस् वा ५० एम.एल. नरिवलको तेल, १०० ग्राम गन्धक र ५० ग्राम अदुवा मिसाई तताएर चिसो पार्ने र पशुको जिउभरि लगाइदिनुहोस् वा ३०० ग्राम सुकेको सुर्तिको पातलाई १ लिटर पानीमा भिजाउने र १ चम्चा नुन हालेर ३ घण्टापछि यो झोल पशुको जीउभरी लगाउनुहोस्।
- पशुहरुमा किर्नाको टोकाईबाट लहुमुते रोग (प्राय: कफी रंगको वा रातो रंगको पिसाव फेर्ने; उक्त पिसाव आधा घण्टा जति सफा टेस्टट्यूव/ शिसाको गिलासमा नहल्लाई राख्दा सतहमा रगत नजम्ने) सर्ने भएकोले किर्नाबाट पशुहरुलाई जोगाउन बुटक्स २ एम.एल. प्रति लिटर पानीमा मिसाई किर्ना भएको ठाँउमा हप्तामा २ पटकको दरले ४ हप्तासम्म स्प्रे गर्नुहोस्।
- खोरेत, चरचरे र भ्यागुते रोग विरुद्द खोप लगाउने समय भएकोले नजिकैको प्राबिधिकसँग सम्पर्क गरि आफ्नो पशुवस्तुलाई समयमै खोप लगाउनुहोस्। खोरेत रोग सम्वन्धी विस्तृत विवरण अनुसूची-४ मा दिईएको छ।
- सामान्य एउटा बयस्क गाई, भैसीलाई दैनिक १ के.जी. सन्तुलित दाना, नल, पराल, हे, भुसा आदिबाट सुख्खा आहारा ५-७ के.जी. र हरियो घाँस २०-२५ के.जी. दिनुहोस्। हरियो घाँसमा कोशे एक तिहाइ र अकोशे दुई तिहाइ भाग मिसाउनुहोस्। यसका साथै प्रति लिटर दुध उत्पादनको लागि ४००-५०० ग्राम थप दाना दिनुहोस्।

कुखुरा, हाँस, बंगुर

- गर्मी मौसममा कुखुरामा देखा पर्ने लक्षणहरु जस्तै- चाँडो-चाँडो सास फेर्ने, पानी धेरै खाने, दाना कम खाने, पखेटा र खुट्टा फालेर बस्ने, अण्डा उत्पादनमा कमी आउने, खोरमा कुखराहरुको मृत्यु हुने आदी भएमा पर्याप्त भेन्टीलेसन प्रदान गर्ने, कुखुराको घनत्व कम गर्ने, तापक्रम अधिक रहेका बेला (दिँउसो १२-३ बजे सम्म) दाना नदिने, पर्याप्त मात्रामा सफा, चिसो पानीको व्यवस्था गर्नुहोस्। साथै, इलेक्ट्रोलाईट र मल्टी भिटामीन पानीमा राखेर दिनुहोस्।
- गर्मी मौसममा कुखुराको भालेको प्रजनन क्षमतामा कमी आउने हुनाले ब्रिडिङ्ग स्टकमा भालेको संख्या बढाएर १२-१५% सम्म राख्नुहोस्। साथै, दानामा भिटामीन-ई तथा सेलेनियमको मात्रा बढाउनुहोस्।
- हाल नेपालका केही स्थानहरुका स्थानीय कुखुराहरु र व्यवसायिक रुपमा पालिएका ब्रोईलरका साथसाथै लेयर्स कुखुराहरुमा पनि हाईलीप्याथोजेनिक एभियन इन्फ्लुएन्जा (HPAI) पुष्टि भएको अवस्थामा आ-आफ्ना स्थानहरुमा पालिएका पंक्षीहरुमा सो रोग लाग्न नदिन निम्नानुसारका उपायहरु अपनाउनुहोस्।
- सम्भव भएसम्म घरपालुवा पंक्षीहरुलाई जंगली वा बसाई सरी आउने पंक्षीहरुको संसर्गमा आउन नसक्ने गरी पाल्नुहोस्।
- आफूले पालेका पंक्षीहरु आकस्मिक रुपमा मर्न थालेमा वा श्वास-प्रश्वास सम्बन्धि रोग देखापरेमा नजिकैको पशु चिकित्शकसँगको परामर्शमा तुरुन्तै प्रयोगशाला परिक्षणका लागि पठाउनुहोस्।

- आफ्नो फार्म, खोर र पंक्षी पालिएका स्थानहरुमा जैविक सुरक्षाका सम्भव भएसम्मका उपायहरु अपनाउनुहोस् । पंक्षी खोरहरुमा काम गरिसकेपछि व्यक्तिगत सरसफाईमा विशेष ध्यान दिनुहोस् ।
- रोगी र अस्वस्थ पंक्षीहरुको मासु नखानुहोस् वा खानको लागी अरुलाई नबेच्नुहोस् । यस्ता रोगी पंक्षीहरुको ओसारपसार पनि पूर्ण रुपमा बन्द गर्नुहोस् ।

मत्स्यपालन

- सबै जातका प्रजननयोग्य माउमाछालाई कुल तौलको १-२ प्रतिशतका दरले २८-३० प्रतिशत प्रोटिन रहेको दाना दिनहुँ नियमित समयमा दिनुहोस् र माउमाछा भएको पोखरीमा पानी बदल्दा बोरिंगको पानी प्रयोग गर्नुहोस् । साथै विकसित अन्डालाई पर्याप्त पोषण पुर्याउन हप्ता दिनको अन्तरमा भिटामिन सी. ०.५ के.जी. र भिटामिन ई २५०० एम.जी. प्रति के.जी. माछाको दरले दानामा मिसाई खुवाउनुहोस् ।
- मध्यपहाडमा कमन कार्प माछाको प्रजनन समय भएको हुँदा प्रजनन पोखरीमा भाले र पोथी लाई २:१ अनुपातमा माछाको सेट राख्नुहोस् । टाँसिने प्रकृतिका अण्डाहरुलाई फिँजाएर ह्याचलिङ्ग कढाउन वा कोरल्नको लागि खर, नरिवलको जटा, प्लास्टिक वा फाईवरको रेशा, झारपात आदि प्रयोग गरेर बनाईने गुन्द्री आकारको करिव २.५ मिटर लम्बाई र १ मिटर चौडाई भएको चट्टि वा लहरा आकारको संरचना "काकावन" लाई चारवटा बाँस वा रुखको हाँगाहरुको किला गाडी प्रजनन गराईने पोखरीभित्र चारै छेउमा लहरै पिँधभन्दा कम्तीमा ३०-४० से.मी. माथिसम्म पारेर किलामा बाँधेर तयार गर्नुहोस् र काकावनलाई पानीको सतह भन्दा १५-२० से.मी. तल राख्नुहोस् ।
- कमन कार्प माछाको अण्डाबाट निस्केको ह्याचलिङलाई अनुसूची-५ मा दिईए अनुसार दानाको प्रयोग गर्नुहोस् ।
- यस समयमा नर्सिङ्ग पोखरीमा ब्याक स्विमर कीराले माछा भुरामा क्षति पुर्याउने हुँदा १.५ कट्ठा भुरा हुर्काउने पोखरीमा ८ लिटर डिजेल, २ लिटर डढेको मोबिल र ५०० ग्राम सरफ मिसाई बनेको घोललाई हावा नचलेको बेला बिहानीपख चारै कुनामा पर्नेगरि छर्कनुहोस् । तत्पश्चात ४-५ घण्टा सो पानीको सतहलाई नचलाउनुहोस् ।
- तराईका जिल्लाहरुमा ग्रास कार्प माछाको प्रजनन समय भएको हुँदा माउमाछाको व्यवहार परिवर्तनको दैनिक रेकर्डका आधारमा प्रति हप्ता माउपोखरीबाट परिपक्व माउ छनौट गरि करीब २४ घण्टा होल्डिङ्ग ट्याङ्कीमा अनुकुलन (acclimatize) गरि प्रजनन गर्नुहोस् । छनौट भाले र पोथी माउमाछालाई शारीरिक तौलका आधारमा ओभाटाइड हार्मोन क्रमशः ०.३५ र ०.७ मिलिलिटर प्रति किलोग्राम दिई २:१ (भाले:पोथी) अनुपातमा स्पनिंगका लागि छाड्नुहोस् । ह्याचरीको पानीको तापक्रम २४-२६ डिग्री सेल्सियस भएको अवस्थामा पोथीले १४-१६ घण्टापछि अन्डा छाड्ने र निषेचन भएको २०-३० घण्टापछि कोरलिन्छ । भुरा कोरलिएको ५$^{औं}$ दिनबाट भुरालाई ल्याक्टोजेन दुध पाउडर वा उसिनेको अन्डाको पहेँलो भागको झोल बनाई दिनुहोस् ।
- प्रजनन् गराइएका माउमाछाहरुलाई सफा र ताजा पानी राखी ह्याचरि वा माउ माछा राख्ने ट्याङ्कीमा पानीको हल्का फोहोरा दिएर २-३ दिनसम्म राखी तत्पश्चात माउ हुर्काउनको लागि तयार गरिएको पोखरीमा राखेर सन्तुलित दाना दिनुहोस् ।
- तराईका जिल्लाहरुमा टिलापिया माछाको प्रजनन समय भएको हुँदा एक लिंगीय टिलापिया उत्पादक ह्याचरी

कृषकहरूले आवश्यक टिलापिया ब्रुड (२००-३०० ग्राम) छनौट गरेर प्रजनन पोखरीमा हापामा सेटिंग गरि प्रति वर्ग मिटर तीन माछाका दरले स्टक गर्नुहोस्।

- मध्यपहाडमा ग्रासकार्पको प्रजनन समय नजिकिँदै गएको हुँदा प्रजननयोग्य माउ माछा छनौट गरि प्रजनन पोखरीमा सार्नुहोस् र ७-१० दिनको अन्तरालमा शारीरिक अवस्था र परिपक्वता प्रगतिका लागि नियमित जाँच गर्नुहोस्। यसो गर्नाले माछामा उत्प्रेरित प्रजनन गर्नु अघि हुने तनाव कम हुन्छ।
- मध्यपहाडमा ग्रास कार्प माछाको ह्याचरी संचालकहरुले माउ माछाको स्टकको यकिन गरेपछि आवश्यक जमरालाई चाहिने गहुँ/ जौको बीउलाई १५ दिनसम्म दिन-बिराई, माटोको सौर्य निर्मलीकरणबाट तयार पारिएको नर्सरी बेडमा वा ५ किलोग्राम क्षमताको प्लाष्टिक ट्रेमा सफा माटो राखी ३ दिनसम्म अँध्यारो वातावरणमा अंकुरण गराउनुहोस्। अंकुरण पछि, बिरुवाहरू प्राकृतिक प्रकाशमा हुर्कन दिनुहोस्, र हजारीको मद्दतले दिनको दुई पटक पानी हाल्नुहोस्।
- करिब १० दिनको वृद्धि पछि, औसत बिरुवाहरूले सर्वोत्तम फसल उचाइ (१५ सेन्टिमिटर) पुग्छन्। त्यसपछि, माटोबाट २ सेन्टिमिटरको दुरीमा बिरुवा काटेर, दैनिक १-२ प्रतिशत शरीरको तौलको दरले माउ माछालाई खुवाउनुहोस्।
- तराईका जिल्लाहरुमा कमन कार्पको भुरा उपलब्ध हुने समय भएकोले नजिकको मत्स्य ह्याचरी/नर्सरीहरुबाट चाहिने भुराको बन्दोबस्त समयमै गर्नुहोस्।

घाँसेबाली

- मध्य पहाड तथा तराई क्षेत्रमा सुम्वा सेटारिया घाँसको बीउ छर्ने समय भएकोले जमिनलाई राम्ररी २-३ पटक खनजोत गरि पर्याप्त चिस्यान भएको व्याडमा छर्नुहोस्। सुख्खा मौसममा व्याड राख्दा बीउलाई १.५ से.मी. गहिराईको कुलेसोमा छर्नुहोस्।
- पहाडी भेगमा सुडान घाँसको बीउ लगाउने समय भएकोले खेतबारीमा सोझै छर्दा १.५ के.जी., हलोको सियोमा लगाउँदा १.२५ के.जी. र लाइनमा लगाउँदा ०.५-०.७५ के.जी. बीउ प्रति रोपनीका दरले छर्नुहोस्।
- सिँचाईको सुविधा भएको ठाउँमा टियोसेन्टि (मकैचरी), सामा लगायतका बर्षे घाँसहरु लगाउन शुरु गर्नुहोस्। जग्गा तयारीको बेलामा टिओसेन्टी, सर्गम र बाजरा घाँसको लागि १००० के.जी. कम्पोस्ट वा गोबरमल, १.८ के.जी. युरिया, ६.५ के.जी. डि.ए.पी. तथा ३.३ के.जी म्युरेट अफ पोटास प्रति रोपनीका दरले वा ६६६ के.जी. कम्पोस्ट वा गोबरमल, १.२ के.जी. युरिया, ४.३४ के.जी. डि.ए.पी. तथा २.२ के.जी म्युरेट अफ पोटास प्रति कट्ठा दरले माटोमा राम्ररी मिलाउनुहोस्।
- लामो समयदेखि पानी नपरेकोले खरबारी, डालेघाँस लगाएको नर्सरी, बेर्ना सारेको बारी तथा गोठ वरिपरी आगो लाग्नबाट बचाउन २-३ मिटर चौडाईमा घाँसपात पतिंगर हटाई अग्नि नियन्त्रण रेखा (Fire corridor) बनाउनुहोस्।

कृषि-मौसम सल्लाह बुलेटिन तयारी गर्ने विशेषज्ञ समूह

क्र.सं	नाम थर	कार्यक्षेत्र	कार्यालय	इ-मेल	सम्पर्क फोन
१	टिका राम चापागाँई	वागवानी	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	chapagaintika@gmail.com	९८५११३३६१२
२	नविन गोपाल प्रधान	वागवानी	राष्ट्रिय वागवानी अनुसन्धान केन्द्र, खुमलटार	navin.pradhan@gmail.com	९८५११००८२०
३	बिभूती पोखरेल	कृषि-मौसम	जल तथा मौसम विज्ञान विभाग, बबरमहल, काठमाडौ	bibhel@gmail.com	९८४३९३१२८४
४	राजेन्द्र कुमार भट्टराई	बाली बिज्ञान	राष्ट्रिय बाली विज्ञान अनुसन्धान केन्द्र, खुमलटार	rkbhattarai@gmail.com	९८४३४७२२७०
५	चेतना मानन्धर	बाली रोग	राष्ट्रिय बाली रोग बिज्ञान अनुसन्धान केन्द्र, खुमलटार	chetana.manandhar@gmail.com	९८४१६२४१८१
६	प्रदिप साह	बाली बिज्ञान	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	pradeep75shah@gmail.com	९८४५०५१८९७
७	सुदीप कुमार उपाध्याय	कीट बिज्ञान	राष्ट्रिय कीट विज्ञान अनुसन्धान केन्द्र, खुमलटार	sudeeppdl@gmail.com	९८४२४३७१५३
८	डा. अमित प्रसाद तिमिल्सिना	बाली विज्ञान	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	timilsinaamit87@gmail.com	९८५५०४७७३३
९	डा. नारायण पौडेल	पशु स्वास्थ्य	राष्ट्रिय पशु स्वास्थ्य अनुसन्धान केन्द्र, खुमलटार	narayan.paudyal@narc.gov.np	९८६३३३५०४६
१०	नबिन रावल	माटो विज्ञान	राष्ट्रिय माटो विज्ञान अनुसन्धान केन्द्र, खुमलटार	nabin_rawal@yahoo.com	९८५७०६५०२१
११	प्रेम तिमलसिना	मत्स्य विज्ञान	मत्स्य अनुसन्धान महाशाखा, गोदावरी	p.timalsina01@gmail.com	९८६९५७९१६७
१२	ऋषिराम अधिकारी	कृषि सञ्चार	राष्ट्रिय कृषि प्रविधि सूचना केन्द्र, खुमलटार	adhikari_rishi@yahoo.com	९८४१९७९२८९
१३	डा. रुपा वास्तोला	पशु आहारा	राष्ट्रिय पशु आहारा अनुसन्धान केन्द्र, खुमलटार	bastola_rupa@yahoo.com	९८४१३१९८३९
१४	डा. विरेन्द्र बहादुर राना	आलुबाली	राष्ट्रिय आलुबाली अनुसन्धान कार्यक्रम, खुमलटार	biru.deep25@gmail.com	९८५१२५५३१५
१५	मुक्ति नाथ झा	कृषि इन्जिनियरिङ्ग	राष्ट्रिय कृषि ईन्जिनियरिङ्ग अनुसन्धान केन्द्र, खुमलटार	muktinath2043@gmail.com	९८६३३८२२५४
१६	रामेश्वर रिमाल	कृषि-मौसम	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	rameshwarrimal@gmail.com	९८५१०४४१३०
१७	लसकुस समीर श्रेष्ठ	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	mfddhm@gmail.com	०१-४११३१९१

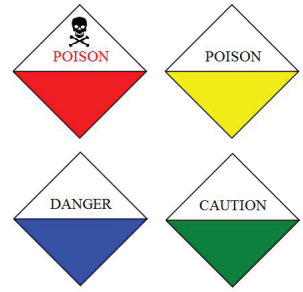
अनुसूची -१: नेपालको मौसम पूर्वानुमानमा प्रयोग हुने शब्दावलि

Terms used in Weather Forecasting in Nepal

बादलको अवस्था (Cloud condition)	सफा (Fair)		No cloud in the sky	
	मुख्यतया सफा (Mainly fair)		1/8 to 2/8 (25%) sky covered by cloud	
	आंशिक बदली (Partly cloudy)		3/8 (26%) to 4/8 (50%) sky covered by cloud	
	साधारणतया बदली (Generally cloudy)		5/8 (51%) to 6/8 (75%) sky covered by cloud	
	अधिकांश बदली (Mostly cloudy)		6/8 (76%) to 7/8 (88%) sky covered by cloud	
	पूर्ण बदली (Cloudy)		8/8 (100%) or all sky covered by cloud	
वर्षाको प्रकृति (Nature of Rain)	Temporary or Brief (क्षणिक वर्षा)		Weather phenomena occur for short span of time usually less than two hour	
	Continuous (लगातारको वर्षा)		Weather phenomena occurring regularly and more often throughout the time duration	
	Intermittent (रोकिदै हुने वर्षा)		Rain occurring and reoccurring at certain intervals	
	Widespread (व्यापक वर्षा)		Weather phenomena extensively throughout an area during specified time duration	
वर्षाको संभाव्यता र यसको क्षेत्र (Rainfall probability in percentage and its coverage)	<10%	None used	Isolated	at one or two places (एक-दुई स्थानमा)
	10-30%	Slight Chance	Widely Scattered	at a few places (थोरै स्थानमा)
	30-50%	Chance/possible	Scattered	at a some places (केही स्थानमा)
	50-80%	Likely	Fairly widespread	at many places (धेरै स्थानमा)
	>80%	More likely	Widespread	at most places (अधिकांश स्थानमा)
संभावित वर्षाको मात्रा (%) = आंकलन X क्षेत्र, जहाँ आंकलन भन्नाले कुनै स्थानमा वर्षा हुन सक्ने संभावना (%) जनाउँदछ भने क्षेत्र भन्नाले तोकिएको स्थानको वर्षा हुन सक्ने संभावित भू-भाग (%) जनाउँदछ। उदाहरणका लागि कुनै स्थानको ८०% क्षेत्रमा ५०% वर्षाको आंकलन गरेको अवस्थामा सो स्थानको संभावित वर्षाको मात्रा (%) = ०.५ X०.८ = ४०% हुन आउँछ।				
वर्षाको मात्रा (Rainfall amount based on total accumulated rainfall during 24 hrs)	Light rain (हल्का वर्षा)		less than 10 mm	
	Moderate rain (मध्यम वर्षा)		10 mm or more but less than 50 mm	
	Heavy rain (भारी वर्षा)		50 mm or more but less than 100 mm	
	Very heavy rain (धेरै भारी वर्षा)		100 mm or more but less than 200 mm	
	Extremely heavy rain (अति भारी वर्षा)		200 mm or more	
समयसिमा (Time Period)	Today (आज)		6 AM to 6 PM	
	Morning (बिहान)		6 AM to Noon	
	Afternoon (अपरान्ह)		Noon to 6 PM	
	Late afternoon (अपरान्हको उत्तरार्ध)		3 PM to 6 PM	
	Evening (साँझ)		6 PM to 9 PM	
	Night (राती)		6 PM to 6 AM (Next day)	

श्रोत: मौसम पूर्वानुमान महाशाखा, जल तथा मौसम विज्ञान विभाग

अनुसूची -२: विषादीको प्रयोग गर्दा ध्यान दिनुपर्ने मुख्य कुराहरु



- सकेसम्म हरियो (◆) र नीलो (◆) लेबल भएको विषादी प्रयोग गर्नुहोस् ।
- विषादीको डब्बामा उत्पादन र एक्सपाइरी मिति हेर्नुहोस् ।
- सुरक्षित ठाउँमा विषादी राख्नुहोस् ।
- सिफारिस गरीए अनुसारको मात्रा प्रयोग गर्नुहोस् ।
- विषादी छर्कने वेलामा मुखमा मास्क, हातमा पञ्जा, खुट्टामा जुत्ता र शरीरको नाङ्गो भागमा कपडाले छोप्नुहोस् ।
- सकभर कडा घाम लागेको, धेरै हावा लागेको, पानी परिरहेको बेला विषादी नछर्नुहोस् ।
- कुनै पनि विषादी छर्दा जुन दिशाबाट हावा आएको छ त्यही दिशातिर फर्केर कहिल्यै छर्नुहुँदैन अर्थात् जुन दिशाबाट हावा

बहेको छ सोही दिशातर्फ फर्केर विषादी छर्ने गर्नुहोस् ।

- कुनै पनि विषादी छर्दा विषादी छर्दै अघि बढ्नु हुँदैन अर्थात् पछि सर्दै आउनु पर्दछ जसले गर्दा विषादी छरि सकेको ठाँउमा चलाउन नपरोस् ।
- कुनै पनि विषादी छरिरहँदा बिचैमा नोजल बन्द भयो भने मुखले फुकेर वा दाँतले खोल्ने गर्नुहुदैन ।
- कुनै पनि विषादीको प्रयोग गरेपछि सकेसम्म पुरै शरिर नुहाउनुपर्दछ र हात खुट्टा नधोई कुनै खानेकुरा खान हुँदैन ।
- विषादी प्रयोग गरीसकेपछि खाली बट्टा वा सिसी बटुलेर खाल्डोमा पुर्नुहोस् र प्रयोग गरेका उपकरणहरु धोएर राख्नुहोस् ।
- विषादी छर्कदा टाउको दुख्ने वा वाक-वाक लाग्ने जस्तो हुन थाल्यो भने तुरुन्त काम छोडेर खुल्ला हावामा केहीबेर बस्नुहोस् । यदि विष लागेको शंका लागेमा नजिकको अस्पताल वा स्वास्थ्य केन्द्रमा जचाउनुहोस् ।
- विषादीको किसिम हेरेर विषादी छरेको खेत जग्गाबाट ३ देखि १५ दिनसम्म कुनै पनि खानयोग्य बालीहरु उपभोग गर्न हुँदैन । साथै गाईवस्तु, कुखुरा आदि लाई पनि खुवाउन हुँदैन ।
- विषादी प्रयोग गर्ने उपकरणहरु (स्प्रेयर) लाई प्रयोग गरीसकेपछि राम्रोसँग पखाली भण्डारमा राख्नुहोस् ।

अनुसूची-३: माटोको सौर्य उपचार विधि

चैत्र देखि जेठ महिनामा नर्सरी राख्ने ठाउँमा माटोमुनि बसेर बाली बिरुवालाई नोक्सानी गर्ने झारपात, जीवाणु, किटाणुहरुको व्यवस्थापन गर्न पारदर्शी प्लाष्टिकले माटोलाई छोपी सुर्यको प्रकाशको मद्दतले माटोको उपचार गर्न यो विधि उपयुक्त मानिन्छ। यसका लागि ब्याड बनाउने ठाउँमा राम्रोसँग खनजोत गरी माटोको डल्ला फुटाई मसिनो पार्ने, झारपात तथा ढुंगालाई हटाउने, आवस्यक पर्ने गोठेमल माटोमा मिलाउने र पानीको निकासको लागि कुलेसो बनाउनुहोस्। जमिनको सतहबाट एक बित्ता उठाएर १ मिटर चौडाई र आवश्यकता अनुसार लम्बाई भएको, बिचको भाग केही उठेको र दायाँ बायाँ केही भिरालो भएको ब्याड राख्नुहोस्। माटो सुख्खा छ भने ६ इन्च गहिरो भिज्ने गरी सिचाई गर्नुहोस्। यसरी तयार भएको ब्याडलाई २५०-३०० गेजको प्लाष्टिकले करिब २५ से.मी .प्लाष्टिक ब्याड भन्दा बाहिर हुनेगरी माटो कालो नुहुन्जेल) करिब ३ हप्ता (छोप्नुहोस्। ब्याड राख्नुभन्दा अगाडी माटोलाई कुटोको सहायताले हल्का चलाउने र करिब ४-५ दिनसम्म चिसो हुन दिई बीउलाई पुरै ब्याडमा एकै दिन छर्नुहोस्। बीउ छरिसकेपछि नउम्रेसम्म छापोको व्यवस्था गर्नुहोस्। यसरी उपचार गरेको माटो करिब ६ महिना सम्म ब्याडको रुपमा प्रयोग गर्न सकिन्छ।

अनुसूची-४: पशुहरुमा लाग्ने खोरेत रोग सम्वन्धी विवरण

खोरेत रोगको उपचार विधि:

- यो विषाणुबाट हुने रोग भएको कारण कुनै खास उपचार छैन तर लक्षण अनुसार उपचार गर्दा नोक्सानबाट बच्न सकिन्छ।
- सर्वप्रथम मुखको घाउलाई मनतातो पानीमा २ प्रतिशतको फिटकिरीको झोल बनाई मुख सफा गर्ने।
- खुट्टाको घाउलाई ०.५ प्रतिशत फर्मालिनको झोल बनाई सफा गर्ने।
- थुनमा आएको घाउलाई २ प्रतिशत वोरिक एसिडको झोल बनाई सफा गर्ने तथा वेटाडिन मल्हम ओभानो पारी लगाउने।
- खुट्टा तथा मुखको घाउ छिटो निको पार्न सल्पाडिमाइडिन वा एण्टीवायोटिक्सको रुपमा २०-४० लाख यूनिट सम्म स्ट्रेप्टो पेनिसिलीन वा २-२.५ ग्राम सम्मको एम्पीसिलिन + क्लोक्जासिलीन ५-७ दिन सम्म मासुमा सुई दिने। साथै एभिल र दुखाई कम गर्ने सुई १० मि.ली को दरले मासुमा सुई दिने।
- कीरा पर्न गएको खुट्टाको घाउलाई मन तातो पानीमा पोटास राखी सफा गर्ने तथा कीरा मार्न तारपिनको तेल घाउमा राख्ने तथा एण्टीसेप्टिक मल्हम घाउमा लगाउने।

रोकथाम

- रोगी पशुलाई तुरुन्त शंका हुनासाथ अलग्गै राख्ने।
- मुखको घाउलाई असर नपर्न दिनको लागि पिउने आहारा खोले, भातको माड वा अन्य झोल खाने कुरा दिने।
- गोठलाई फिनेल पानीले छर्कने।
- स्वास्थ्य पशुहरुलाई रोग विरुद्ध खोप लगाउने। खोप लगाउदा रक्षा नामक इण्डियन भ्यक्सिन २ एम.एल. ६ महिना भन्दा माथी उमेर भएका पशुमा छाला मुनी (S/c) सुई दिने।
- ट्राईभेट भ्याक्सीन पनि विभिन्न औषधी कम्पनीहरुले निकालिएको बजारमा पाइन्छ, जुन चरचरे, भ्यागुते, तथा खोरेतको विरुद्ध निकालिएको खोप हो, तर त्यसले विषाणुको प्रकोप चारैतिर भएमा रोगबाट पूर्ण रुपमा पशुलाई (रोगबाट) बचाउन सक्दैन, तसर्थ खोरेत कै मात्र कम गर्ने भ्याक्सीन कृषक वर्गहरुलाई पशुमा खोप लगाउन सल्लाह दिइन्छ।
- एफ.एम.डी. पोलिभ्यालेन्ट भ्याक्सिन (FMD poly valent vaccine) गाई-भैंसी, बाच्छा/पाडालाई १० एम.एल. तथा भेडा, बाख्रा, बंगुरलाई ५ एम.एल. छालामुनि सुई दिने।

अनुसूची-५: कमन कार्प माछाको ह्याचलिंगलाई दैनिक दाना / आहारा दिने तालिका

समय अवधी	दानाको प्रकार	दाना दिने दर	प्रति दिन
पहिलो हप्ता	सानो जु-प्लाङ्कटन, अन्डाको झोल, ३०-३५% प्रोटिनयुक्त पाउडर दाना (भटमासको पिठो, गहुँको चोकर, पिना, फिसमिलको मिश्रण)	शारीरिक तौलको आधारमा १५-२०% (प्रति एक लाख) हाचलिंगलाई प्रति दिन ४ वटा अन्डाको झोल, १०-१५ ग्राम तयारी दाना	३-४ पटक
दोश्रो हप्ता	ठुलो जु-प्लाङ्कटन, ३०-३५ % प्रोटिनयुक्त क्रम्बल नं.-१ दाना (भटमासको पिठो, गहुँको चोकर, पिना, फिसमिलको मिश्रण)	शारीरिक तौलको आधारमा १०-१५% (प्रति एक लाख) हाचलिंगलाई प्रति दिन २५०-२७५ ग्राम तयारी दाना	३ पटक
तेश्रो हप्ता	ठुलो जु-प्लाङ्कटन ३०-३५% प्रोटिनयुक्त क्रम्बल नं.२ दाना (भटमासको पिठो, गहुँको चोकर, पिना, फिसमिलको मिश्रण)	शारीरिक तौलको आधारमा ८-१०% (प्रति एक लाख) हाचलिंगलाई प्रति दिन ४५०-५०० ग्राम तयारी दाना	३ पटक
चौथो हप्ता	ठुलो जु-प्लाङ्कटन ३०-३५% प्रोटिन युक्त क्रम्बल नं.३ दाना (भटमासको पिठो, गहुँको चोकर, पिना, फिसमिलको मिश्रण)	शारीरिक तौलको आधारमा ५-१०% (प्रति एक लाख) हाचलिंगलाई प्रति दिन ७००-७५० ग्राम तयारी दाना	२-३ पटक

Annex 11.7: List of experts involved in agro-met advisory preparation in 2078/79 (2021/22)

क्र.सं	नाम थर	कार्यक्षेत्र	कार्यालय	इ-मेल	सम्पर्क फोन
१	डा. टिका राम चापागाँई	वागवानी	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	chapagaintika@gmail.com	९८५११३३६१२
२	डा. शान्ता कार्की	वागवानी	राष्ट्रिय फलफूल विकास केन्द्र, कीर्तिपुर	ncfd.gov.np@gmail.com	०१-५९०५०३७
३	विष्णु प्रसाद पौडेल	माटो विज्ञान	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	bishnu.env@gmail.com	९८४२६९१७२३
४	डा. सञ्जय विष्ट	कीट बिज्ञान	राष्ट्रिय कीट विज्ञान अनुसन्धान केन्द्र, खुमलटार	sanjayabista@gmail.com	९८५११९१३९०
५	सुदिप कुमार उपाध्याय	कीट बिज्ञान	राष्ट्रिय कीट विज्ञान अनुसन्धान केन्द्र, खुमलटार	sudeeppdl@gmail.com	९८४२४३७१५३
६	नविन गोपाल प्रधान	वागवानी	राष्ट्रिय वागवानी अनुसन्धान केन्द्र, खुमलटार	navin.pradhan@gmail.com	९८५११००८२०
७	डा. इन्दिरा कँडेल	कृषि-मौसम	जल तथा मौसम विज्ञान विभाग, बबरमहल, काठमाडौ	kadelindira@gmail.com	९८४१७३५५६०
८	बिभूति पोखरेल	कृषि-मौसम	जल तथा मौसम विज्ञान विभाग, बबरमहल, काठमाडौ	bibhel@gmail.com	९८४३९३१२८४
९	राजेन्द्र कुमार भट्टराई	बाली बिज्ञान	राष्ट्रिय बाली विज्ञान अनुसन्धान केन्द्र, खुमलटार	rkbhattarai@gmail.com	९८४३४७२२७०
१०	चेतना मानन्धर	बाली रोग	राष्ट्रिय बाली रोग बिज्ञान अनुसन्धान केन्द्र, खुमलटार	chetana.manandhar@gmail.com	९८४१६२४१८१
११	डा. प्रदीप शाह	बाली विज्ञान	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	pradeep75shah@gmail.com	९८४५०५१८९७
१२	डा. नारायण पौडेल	पशु स्वास्थ्य	राष्ट्रिय पशु स्वास्थ्य अनुसन्धान केन्द्र, खुमलटार	narayan.paudyal@narc.gov.np	९८६३३३५०४६
१३	डा. अमित प्रसाद तिमिल्सिना	बाली विज्ञान	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	timilsinaamit87@gmail.com	९८५५०४७७३३
१४	डा. रुपा वास्तोला	पशु आहारा	राष्ट्रिय पशु आहारा अनुसन्धान केन्द्र, खुमलटार	bastola_rupa@yahoo.com	९८४१३१९८३९
१५	नबिन रावल	माटो विज्ञान	राष्ट्रिय माटो विज्ञान अनुसन्धान केन्द्र, खुमलटार	nabin_rawal@yahoo.com	९८५७०६५०२१
१६	प्रेम तिमलसिना	मत्स्य विज्ञान	राष्ट्रिय मत्स्य अनुसन्धान केन्द्र, गोदावरी	p.timalsina01@gmail.com	९८६९५७९१६७
१७	अनिता गौतम	मत्स्य विज्ञान	राष्ट्रिय मत्स्य अनुसन्धान केन्द्र, गोदावरी	ganita_2014@yahoo.com	९८४९००९०९९
१८	ऋषिराम अधिकारी	कृषि सञ्चार	राष्ट्रिय कृषि प्रविधि सूचना केन्द्र, खुमलटार	adhikari_rishi@yahoo.com	९८४१९७९२८९
१९	डा. विरेन्द्र बहादुर राना	आलुबाली	राष्ट्रिय आलुबाली अनुसन्धान कार्यक्रम, खुमलटार	biru.deep25@gmail.com	९८५१२५५३१५
२०	मुक्ति नाथ झा	कृषि इन्जिनियरिङ्ग	राष्ट्रिय कृषि ईन्जिनियरिङ्ग अनुसन्धान केन्द्र, खुमलटार	muktinath2043@gmail.com	९८६३३८२२५४
२१	रामेश्वर रिमाल	कृषि-मौसम	राष्ट्रिय कृषि वातावरण अनुसन्धान केन्द्र, खुमलटार	rameshwarrimal@gmail.com	९८५१०४४१३०
२२	निराजन सापकोटा	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	sniraj10_dhm@yahoo.com	९८५८०५५२३४

क्र.सं	नाम थर	कार्यक्षेत्र	कार्यालय	इ-मेल	सम्पर्क फोन
२३	प्रतिभा मानन्धर	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	parutiba@gmail.com	०१-४११३१९१
२४	राजुधर प्रधानाङ्ग	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	raj.prd@gmail.com	९८४१२०८९३४
२५	बरुण पौडेल	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	paudelbarun2016@gmail.com	९८४१२७९६७२
२६	मिन कुमार अर्याल	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	aryalmean@gmail.com	९८४३४५०७८८
२७	लसकुस समिर श्रेष्ठ	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	lasakusa.shrestha@nepal.gov.np	९८१३८६९८८५
२८	मन्जु बासी	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	happymanju2014@gmail.com	९८४३१५९९१५
२९	गंगा नगरकोटी	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	ganga.nagarkoti.239@gmail.com	९८४१७६३६७४
३०	सजिना शाक्य	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	sajeenashakya@gmail.com	९८४३०६४४८२
३१	हिरा प्रसाद भट्टराई	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	maharjan.binu01@gmail.com	९८४११५८७५८
३२	बिनु महर्जन	मौसम पूर्वानुमान	मौसम पूर्वानुमान महाशाखा, गौचर, त्रि. अ. बि.	bhattaraihira2@gmail.com	०१-४११३१९१

Annex 11.8: Regular annual budget and expenditure in 2078/79 (2021/22)

Budget Code	Budget heads	Annual Budget	Expenses	Balance
21***	Staff expenses			
21111	Basic Salary	6709000.00	6685510.50	23489.50
21121	Uniform	1100000.00	110000.00	0.00
21132	Dearness allowance	254000.00	254000.00	0.00
21134	Meeting allowance	949000.00	948600.00	400.00
21213	Contribution based Insurance	51000.00	50800.00	200.00
22***	Operational and Administrative expenses			
22111	Water and electricity	51000.00	24192.55	17807.45
22112	Communication	114000.00	97406.00	16594.00
22212	Fuel vehicle	552000.00	529663.23	22336.77
22213	Vehicle maintenance	330000.00	330000.00	0.00
22214	Insurance	80000.00	76500.00	3500.00
22221	Machinery and equipment maintenance expenditure	159000.00	135109.50	23890.50
22291	Others operational Assets Maintenance	105000.00	60591.00	44409.00
22311	Office expenditure	324000.00	262351.50	61648.50
22313	Books and materials expenditure	30000.00	21627.00	8373.00
22314	Fuel others	24000.00	17210.00	6790.00
22315	Newspapers, printing and information publishing expenditure	675000.00	554604.00	120396.00
22413	Contract Service Charge	75000.00	50968.00	24032.00
22512	Skill Development and Public Awareness Workshop	600000.00	549195.00	50805.00
22521	Production materials/ Service expenditure	1353000.00	862803.29	490196.71
22612	Travel expenses	1104000.00	934130.50	169869.50
22711	Contingency Expenses	203000.00	202962.00	38.00
28143	Vehicle, machinery and equipment rent expenses	145000.00	111300.00	33700.00
	Total	**13988000**	**12869524.07**	**1118475.93**
31122	Machinery and equipment's	555000.00	545677.60	9322.40
31123	Furniture and Fixture	105000.00	104552.00	448.00
	Total	660000.00	650229.60	9770.40
	Grand Total	**14648000.00**	**13519753.67**	**1128246.33**

Annex 11.9: Special Project annual budget and expenditure in 2078/79 (2021/22)

Budget Code	Budget heads	Annual Budget	Expenses	Balance
21***	Staff expenses			
21135	Staff Incentive allowance	263340.00	131512.50	131828.00
22***	Operational and Administrative expenses			
22112	Communication	30000.00	0.00	30000.00
22212	Fuel (office use)	75000.00	18199.50	56800.50
22221	Machinery and equipment maintenance expenditure	50000.00	49576.50	423.50
22311	Office expenditure	40000.00	0.00	40000.00
22315	Newspapers, printing and information publishing expenditure	30200.00	0.00	30200.00
22512	Training and Seminar	425000.00	0.00	425000.00
22521	Production materials/ Service expenditure	175000.00	91417.00	83583.00
22611	Monitoring expenses	43000.00	0.00	43000.00
22612	Travel expenses	450000.00	105832.50	344167.50
22711	Contingency Expenses	55000.00	0.00	55000.00
28143	Vehicle, machinery and equipment rent expenses	40000.00	0.00	40000.00
	Total	**1676540.00**	**396537.50**	**1280002.50**

Annex 11.10: Revenue status in 2078/79 (2021/22) (*In Nepalese Rupees*)

Source	Total	Remarks
Administration Income	5000.00	
Research materials	5940.00	
Grand Total	**10940.00**	

Annex 11.11: Beruju status in 2078/79 (2021/22) (*In Nepalese Rupees*)

Beruju	Amount	Remarks
Beruju till last year	0.00	
Beruju cleared this FY	0.00	
Remaining Beruju	0.00	

Interaction with farmers in Jumla during roving seminar

Interaction with stakeholders about impact of climate change in Tanahu