AgriPath – *'Empowering smallholder farmers' transition to sustainable agriculture through effective and efficient digital pathways'*

Integrating digital agro-advisory services in farmer field schools: Insights from Nepal

AgriPath Project
Kathmandu University
School of Arts | 2025

Authors

Sagar Raj Sharma*, Hritika Rana**, Bristi Vaidya***

AgriPath Project, Kathmandu University

* Sagar Raj Sharma is a Professor of Development Studies and the Principal Investigator of Agripath project at Kathmandu University

** Hritika Rana is a Post-Doc fellow at Kathmandu University, under the AgriPath project

*** Bristi Vaidya is a PhD candidate at Kathmandu University under the agripath project

Design and Layout

Kul Bahadur Thapa Magar
Crimson Design and Print

Contents

Preface i

Acronyms and Abbreviations iii

List of Tables iv

1. Background 1

2. Objectives of the FFS 1

3. Selection of FFS facilitator 2

4. Selection of study site and farmer group 3

5. Jhamkeswori Krishak Samuha 4

6. Participants' background 5

7. Weekly FFS session plan 5

8. Farm plot selection 7

9. Farm plot division and description 7

10. Crop and seed selection 9

11. Group division 10

12. Weekly schedules 11

    12.1 Integration of DAS in FFS 11

    12.2 Expert led specialized sessions 13

13. Reflections from the participants 15

14. Key learnings 16

15. Final words 18

ANNEX 19

ANNEX 1: Details of the FFS 19

ANNEX 2: Weekly schedules of the FFS 20

ANNEX 3: Crop calendar 26

ANNEX 4: Comparison of input and output between Farmer plot and FFS plot 27

ANNEX 5: Experiences as shared in the FFS journey video 30

Preface

Farmer Field School (FFS) is a people-centered agricultural extension approach, which was first introduced in Asia in the late 1980s, by the Food and Agriculture Organization (FAO). It was introduced to mitigate the adverse effects of chemical and pesticide use on human health and the environment. While FFS initially focused on Integrated Pest Management (IPM), it today covers a wide range of topics including value chains, nutrition, and also life skills, among others.

FFS was first introduced in Nepal in 1997 through the Technical Cooperation Project supported by FAO on IPM. In 2007, the Agriculture Extension Strategy of Nepal officially recognized FFS as a participatory extension approach, and continues to be regarded as an institution to generate and disseminate technology in order to enhance productivity. At present, various government and non-government agencies use the FFS approach to exchange different agricultural information to the farmers in the country.

In this regard, Kathmandu University (KU), under its AgriPath project had an opportunity to design and conduct a FFS as a part of its research activities. AgriPath project entitled *'Empowering smallholder farmer's transition to sustainable agriculture through effective and efficient digital pathways'*, is a multi-country project, which aims to explore the potential of digital agro-advisory services (DAS) in empowering smallholder farmers, with a focus on sustainable agriculture practices.

The KU team followed the FFS guidelines provided by the Department of Agriculture, Ministry of Agriculture and Livestock Development, Government of Nepal, while designing the FFS. The FFS focused on integrating DAS into the regular FFS sessions so that the farmers would get an opportunity to use various digital tools to enhance their knowledge on adoption of DAS as well as implementation of sustainable agriculture practices (SAP). The FFS sessions were designed with the facilitation of various DAS experts and service providers. It was a new experiment conducted by the KU AgriPath team, which turned out to be rather successful, based on the feedback of the participant farmers.

This report summarizes the journey of the digital FFS in detail. It focuses on the process of conducting FFS with an integration of various digital tools throughout the FFS sessions. It also provides in brief the reflections and learnings of conducting such a platform for the smallholder farmers at a local level in Nepal.

Considering the limited effectiveness of the agriculture extension in Nepal, and advancement in information and communication technology, this report is intended for researchers, non-governmental and community-based actors, government actors, trainers, and students who are interested in the field of sustainable agriculture, digital agro-advisory services, and farmer field school.

This document is an outcome of a collective effort, and we would like to express our heartfelt gratitude to everyone involved. First and foremost, we would like to extend our gratitude to all the participants of Jhamkeshwori farmer group - *didis, dais*, *bahinis and bhais,* whose interest, dedication, and active participation made FFS a success. Our special thanks to the office of Ward no. 8, Chaimale, and the Dakshinkali Municipality for

their invaluable support throughout the research activity. We would like to express our sincere gratitude to Dr. Krishna Prasad Pant, Agricultural economist, for his invaluable expertise and guidance, which was instrumental from the beginning to the successful implementation of the FFS. Finally, we are particularly grateful to the AgriPath project, supported by Centre for Development and Environment (CDE), University of Bern and funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), for making this possible.

Authors
Kathmandu University

April 30, 2025

Acronyms and Abbreviations

AITC	Agriculture Information and Training Center
DAP	Di-ammonium Phosphate
DAS	Digital Agro-Advisory Services
DOA	Department of Agriculture
FAO	Food and Agriculture Organization
FFS	Farmer Field School
ICIPE	International Centre of Insect Physiology and Ecology
IPM	Integrated Pest Management
KU	Kathmandu University
NARC	Nepal Research Agriculture Council
SAP	Sustainable Agriculture Practices

List of Tables

Table A1: Details of the Farmer Field School 19

Table A2: Schedules for Twenty Weeks of FFS 20

Table A3: Crop Calendar for wheat prepared by the FFS participants 26

Table A4: Input and Output Comparison of Farmer and FFS plots 27

1. Background

The AgriPath project entitled *'Empowering smallholder farmer's transition to sustainable agriculture through effective and efficient digital pathways'* seeks to improve smallholder farmers' access to digital solutions and sustainable agriculture practices to enhance the wellbeing of rural communities and to enhance sustainable use of the natural resources.

The project is being implemented across 5 target countries: Burkina Faso, Tanzania, and Uganda in Sub-Saharan Africa, and India and Nepal in Asia. The project consortium includes partners from different countries, including Centre for Development and Environment (CDE) at the University of Bern, University of Laussane, Switzerland, International Centre of Insect Physiology and Ecology (ICIPE), Kenya, Grameen Foundation, USA, Grameen Foundation, India, farmbetter ltd, London, and Kathmandu University, Nepal. Additionally, the local implementing partners of the project are Kilimo Trust in Tanzania and Uganda, SEMUS in Burkina Faso, and iDE in Nepal.

As a research partner, Kathmandu University designed a quasi/pre-experimental participatory action research and conducted a Farmer Field School (FFS) as one of the research activities. The main aim of the research activity was to understand barriers and factors for the adoption of digital agro-advisory (DAS) services through a platform of FFS.

2. Objectives of the FFS

The main objectives of the FFS were as follows:

- To enhance relevant technical knowledge and awareness of farmers, identify and include different DAS in a weekly schedule based on farmer's needs and recognize content that can be exchanged through digital mediums.
- To identify the possibilities that farmers can use digital mediums to access agriculture related information, knowledge, farming advisory, weather forecasts/bulletin, and market access.
- To conduct digital farmer field school to make farmer's learning more effective and focus positively on sustainable agriculture approaches.
- To enable farmers to make informed decisions about using DAS based on the learnings and experiences gained from FFS.

3. Selection of FFS facilitator

A local facilitator was recruited to ensure smooth and effective implementation of the planned FFS. Based on the list of Integrated Pest Management (IPM) trainers provided by the Department of Agriculture (DOA) of Nepal, different facilitators were contacted followed by site visits and interviews with potential facilitators. Among them, Mr. Radha Krishna Chapagain was selected as a facilitator for the FFS. Mr. Chapagain is a native resident of Dakshinkali Municipality and is fluent in the local languages *(Nepali and Tamang)*. He had participated in IPM training provided by the Nepal Government, and also had prior experience of conducting FFS.

The local facilitator engaging with participants and starting the FFS session

The main responsibilities of the facilitator were to:

- Prepare schedules for weekly FFS sessions.
- Search for solutions to the challenges shared by participant farmers in the FFS.
- Inform participants about the importance of maintaining soil nutrients.
- Organize special classes based on the problems and needs shared by the participants.
- Update participants on different agricultural subsidy schemes and budget.
- Provide skills on improving conventional farming practices and implementing modern farming techniques.
- Enhance the decision making capability of the participant farmers.
- Provide information on a variety of digital agro-advisory services.

4. Selection of study site and farmer group

Once the local facilitator was on board, farmer groups in 9 different wards of Dakshinkali Municipality were contacted to find out about the general situation of agriculture in the area and to learn about the needs of the farmers. Some of the major challenges faced by farmers in these wards were deteriorating soil quality and decreased production of cereal crops.

A scenic view of the Dakshinkali Municipality, reflecting its ongoing transition to commercial farming

Based on the challenges shared by the farmers of various farmer groups, 4 farmer groups were further identified: *Swabalamban Mahila Samuha* – Ward no. 06, *Dakshin Manakamana Krishak Samuha* – Ward no. 6, *Jhyutiki Krishak Samuha* – Ward no. 07 and *Jhamkeshwori Krishak Samuha* – Ward no. 08. Accordingly, to get an in-depth understanding of the challenges, the KU team conducted several field visits and conducted meetings with the farmer groups, which was facilitated by the local facilitator.

Meeting with farmer groups in ward no. 06 reflected that farmers were more interested in mushroom farming. Farmers in Ward no. 07 were involved in

commercial farming. Accordingly, farmers of *Jhamkeshwori Krishak Samuha* – ward no. 08 highlighted that they have knowledge on traditional farming practices but lack reliable information on the type of seed, fertilizer, and pesticide, and have had bad experiences with agro-vets.

Given their needs and eagerness, the KU team weighed the opportunities and learning attitude of the farmers and decided to conduct the FFS with *Jhamkeshwori Krishak Samuha* of ward no. 08.

5. Jhamkeswori Krishak Samuha

Jhamkeshwori Krishak Samuha (Jhamkeshwori Farmer Group) started in 2021 in Chaimale, ward no. 8 of Dakshinkali Municipality, Kathmandu. The group consists of 30 members, 20 women and 10 men. The primary objective of forming the group was to collectively gather and sell their agricultural produce to the market. Additionally, the group aimed to access agricultural extension services from the government institutions, which would otherwise be difficult to access as individual farmers.

Participants from the Jhamkeshwori farmer group posing for a group photo after a FFS field work

The group has an executive committee which comprises of a president, vice-president, secretary, and a treasurer who are elected by the group members.

Group meetings are held on the third of every month, with almost all the members participating in them.

The members of this group cultivate a variety of produce including cereal crop such as rice, wheat, buckwheat, and corn; seasonal vegetables such as tomato, chili, cucumber, pumpkin, long beans, cabbage, cauliflower, spinach, radish, and onion; and spices such as mustard, turmeric, garlic and ginger.

6. Participants' background

Out of the total 30 members of the group, 26 members regularly participated in the FFS, comprising of 19 female and 7 male members. All the participants were local smallholder farmers, whose age ranged from 24 to 68. In terms of their ethnic background, other than one participant who was a *Brahmin*, all of them belonged to the *Tamang* ethnic community. As the local facilitator was fluent in both Nepali and *Tamang* language, he was able to have a smooth communication and engage with all the participants.

7. Weekly FFS session plan

To ensure smooth execution of FFS, a preparatory meeting was conducted prior to the actual FFS sessions. The meeting involved the AgriPath team from KU, the local facilitator, members of the Jhamkeshwori Farmer Group, other interested farmers and local stakeholders. It was held at a local secondary school in the area, Shree Ghyampadevi Basic School.

Participants engage in preparations and discussion ahead of the preparatory week meet

After different rounds of discussion, decisions related to the FFS sessions were made using a participatory approach. All the participants, particularly women, pro-actively participated in the discussion and made the following decisions:

- FFS sessions led by the local facilitator were to be conducted every Monday. Monday was selected as the day to conduct FFS because females shared that they would be free to attend the FFS, while their children would be at school. Saturday was not considered suitable, as children would be at home, which would occupy the mothers. Accordingly, it was unanimously agreed that Monday would work best for the majority.
- The FFS sessions were scheduled from 11 am to 3 pm. This timing was selected because female farmers would have completed most of their morning chores, including sending their children to school by 11 am. With the children at school during that time period, mothers would have the time to attend the FFS sessions.
- A tea break in the middle of the session was included to provide a short break and refreshment to the participants.
- Wheat was considered the most appropriate crop for the season and was selected to be cultivated for the FFS demonstration. Selection of crop is further discussed in section 10.
- A female farmer from the farmer's group voluntarily provided 3 *ropanis*[1] of her personal land to be used for FFS demonstration, and this proposal was unanimously welcomed by all the group members. Additionally, it was decided that the land would be provided free of cost for the FFS demonstration, given that the organizers will not take the harvested produce, giving farmers the ownership of their production. Farm plot selection and its division is explained in detail in section 8 and 9.

A part of the land volunteered by a female participant for FFS demonstration

[1] 1 ropani = approximately 0.0508738 hectare

- Further, the same female member volunteered to provide a room at her house to be used as a hall to conduct FFS classes.
- It was concluded that the classes will be held for a full wheat crop cultivation cycle, which could take at least 6 months to complete.

8. Farm plot selection

In order to select a farm plot for FFS, the KU team held different meetings with the local facilitator along with the farmer group members, and local stakeholders i.e. ward and municipality office. Various options were considered during the meetings, including buying a plot of land, leasing the land, or partnering with the ward office. In the process of considering these options, a female farmer from the farmer group volunteered to provide 3 *ropanis* of her land, which was then agreed by everyone to be used as farm plot for FFS demonstrations.

9. Farm plot division and description

The total land was segregated into two parts, namely, 'Farmer plot' and 'FFS Plot'. Each plot covered an area of 762 sq. meter and was separated by a small path. Each plot were further subdivided into three plots according to the three different seeds sowed i.e. *Swargadwari, Bheriganga,* and WK1204, resulting in 6 different plots in total with an area of 254 sq. meter each.

The FFS plot and Farmer plot segregated and labelled for easy recognition

In farmer's plots, participants cultivated wheat applying the techniques that they were regularly using. In FFS plots, participants cultivated wheat based on the techniques learned during FFS. Various inputs were applied to the farmer plots and the FFS plots as required.

Laying the ground work for wheat cultivation

Soil from all the plots were collected and tested. Soil was tested in two ways. First, it was sent to the Central Agriculture Lab, Hariharbhawan, Lalitpur. Secondly, participants tested it themselves using a soil test kit, with the assistance of the facilitator. Based on the results, bio and compost fertilizers were applied to all the plots. However, chemical fertilizer such as Di-Ammonium Phosphate (DAP), Potash, and Urea, were used only in farmer plots.

Men and women participants working together to collect soil sample for soil test

Soil moisture was tested using a soil moisture meter. According to the results, flood irrigation method was used to irrigate all the plots. Weeds were more prevalent in farmer plots, where manual methods were employed to manage it.

In terms of pesticide use, a neem (margosa) based pesticide was used in all the plots to manage aphid infestation, which were observed in all the plots. In addition, a chemical pesticide, G-sunami, was applied in the farmer plots. Furthermore, due to rat infestation in the farmer plots, which was near a water body, rat cake was used to control it.

The outputs from both the plots were then compared on the basis of different inputs used in two different plots. The total yield in FFS plots was found to be higher as compared to the total yield of farmers' plots. Input and outputs of different plots are presented in Annex 4, Table A4.

10. Crop and seed selection

The decision on crop selection was made through a participatory approach. During the preparatory week meeting, farmers discussed and decided to focus on and cultivate a cereal crop for the FFS. Initially, wheat and buckwheat were the two main options considered. But, as buckwheat was not suitable to be cultivated during the month of November, wheat was chosen as the crop for the FFS. A crop calendar for wheat was prepared by the participants of FFS as one of the activities in the FFS. The crop calendar is provided in Annex 3, Table A3.

One of the main reasons for farmers' decision to select a cereal crop was based on their observation that farmers in the ward were getting more attracted to commercial crops such as vegetables, and were no longer attracted to grow cereal crops. This had led to decrease in cultivation of cereal crop. The farmers hoped that focusing on wheat crop in the FFS would encourage other farmers to cultivate cereal crops.

Furthermore, the KU team also believed that wheat would have international value recognition as it is cultivated and consumed globally. In addition, the learnings from the action research could be applied to future research in various parts of the world.

Finally, based on the availability of wheat seeds in the market, three different varieties of local wheat seeds were sourced: *Swargwadwari* (5 kg), *Bheriganga* (8 kg) and WK1204 (5 kg). Total 18 kg of seeds were sown, considering 6 kg of seed can be used in each *ropani* of land. Each wheat variety was checked for its production capacity, as well as its resistance to pests and diseases. Additionally, WK1204 was particularly assessed for the susceptibility of pest and disease infestation.

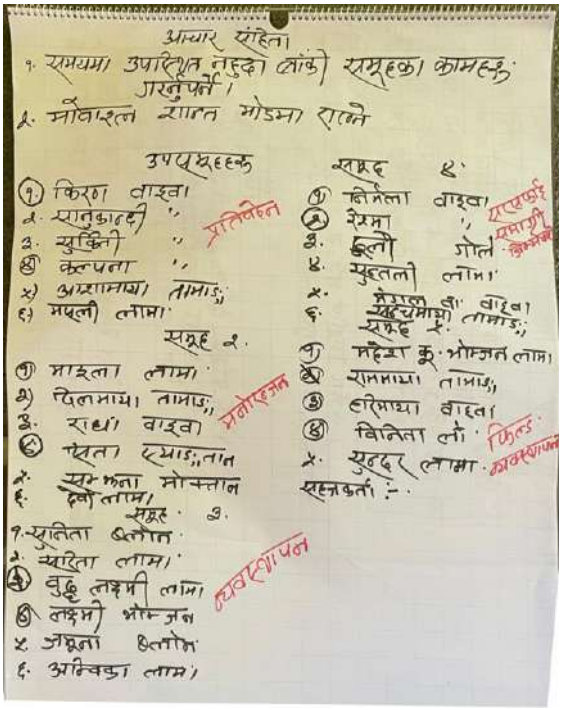
Three varieties of wheat seeds used for FFS demonstration

During the FFS, information on the difference between local and certified seed varieties and the importance of differentiating between them were exchanged. Through practical demonstrations and observations, farmers were able to gain firsthand information on how different seed varieties affect production and impact crop yield.

11. Group division

Participants of the FFS were divided into 5 groups. Each group consisted of 5 participants, except for one group, which had 6 participants.

Farmers named their groups based on the names of local animals and insects that they could relate to and easily remember. The groups were named *Bhyaguta* (Frog), *Makaura* (Spider), *Gainekira* (Dragonfly), *Dhusi* (Fungus), and *Phatyangra* (Grasshopper). Each group were assigned responsibilities to manage their group activities, such as group management, report writing, and organizing entertainment activities.



Division of participants into five groups for the FFS sessions

12. Weekly schedules

The weekly schedules were developed based on the main objectives of FFS (main objectives are provided in Section 2), and the FFS guidelines provided by the Department of Agriculture, Ministry of Agriculture and Livestock Development, Government of Nepal. In addition, insights from the past experiences of the KU team and several rounds of discussion with agricultural experts helped shape the schedules. The initial draft was then shared with the local facilitator, who contextualized and provided final inputs.

The schedules outlined the key tasks for each week. It covered topics such as improvement of soil quality, land preparation techniques, identifying seed quality variety and treatment, identification and management of insect pest and diseases, safe handling of pesticides, agro-advisory on weather, irrigation practices, identification of crop growth and harvest stages, market demand and price, and integration of DAS.

Female participants assess the environment as a part of the weekly task

12.1 Integration of DAS in FFS

In addition to verbal explanations and hands-on demonstrations, several digital tools were integrated in the FFS. Digital tools were integrated in the weekly schedules of the FFS, to introduce farmers to different DAS. These digital tools included a projector, laptop, tablet, mobile phones, e-copy of *Krishi* (Agriculture) Diary[2], *Kisan* (Farmer) Call Center of Nepal Research Agricultural Council (NARC)

[2] Krishi Diary is an annual handbook prepared and published by Agriculture Information and Training Center (AITC), Nepal. It includes important agriculture related information such as data, figures, contact details, plans, policies, rules and regulations, and projects in Nepal.

and Agriculture and Training Center (AITC), and agricultural mobile applications such as GeoKrishi, farmbetter, Hello Dakshinkali and Superkrishak.

In this regard, different tools were integrated in the FFS activities according to its features. Projector and laptop were used for multimedia presentations to enhance the learning experience of the participants. E-copy of *Krishi* Diary, was shared to all the farmers, to inform them on its availability, and to familiarize them with the agricultural content available in it. Farmers were also informed about the call centers, which they were not previously aware about. During one of the sessions, the local facilitator demonstrated how the call center operates by contacting the call centers and exchanging farmers' farm related problems. Various mobile applications with different features, via mobile phones and tablet were introduced to the farmers. Features in the applications included information on package of practice tailored according to the crop which included information on pre-planting, plantation, harvest, and crop calendar. Additionally, soil information, weather forecast, market price, pest and disease management, and agricultural expert consultation through message and photo query, were also introduced and demonstrated to the participants.

FFS facilitator guides the participants with their queries regarding the digital agro-advisory service – mobile application

Furthermore, as Wi-Fi was not available in the building where the FFS was conducted, mobile data was provided to five farmers – one member each from 5 groups (as explained in Section 11), who were better accustomed and had better knowledge of using digital tools i.e. a smart mobile. Mobile data was used

as a hotspot to facilitate FFS activities. In addition, to enhance communication and better information sharing, a 'Viber group' named '*digital chhaimale krishak pathshala*' group was created. It allowed farmers to communicate with the local facilitator and the KU team members, and share the exchanged information to other farmers in their respective groups. The communication focused on exchanging FFS farm updates, challenges, and identifying techniques to manage the challenges.

Women participants exploring different features of a mobile application as introduced in the FFS

12.2 Expert led specialized sessions

During the FFS, experts from various agricultural extension service agencies participated and conducted specialized sessions.

Participants engaged in an expert led session

A plant pathologist from a government organization, Nepal Agricultural Research Council (NARC), presented on wheat related diseases and pests, identification of harmful and beneficial insects, and proper seed storage techniques. The expert also visited the field and engaged directly with the farmers through practical demonstrations.

An expert from NARC provide a hands-on explanation of pest and disease management to the participants

Additionally, representatives from the Dakshinkali Municipality office also organized a session. They interacted with the participants and shared Municipality's agricultural plans, such as annual soil test and other initiatives at the local, provincial and central levels. Discussion also covered subsidies for plastic used for tunnel farming under off-seasonal vegetable farming. The 'Hello Dakshinkali' mobile application developed by Dakshinkali Agriculture section was also introduced to the participants.

Furthermore, non-government organizations also conducted valuable sessions. iDE, Nepal delivered an insightful session on IPM, FFS on wheat crop, market access and marketing strategies. They also introduced the farmbetter application to the farmers and provided hands-on training. Accordingly, representative from GeoKrishi familiarized their farm application to the participants and practically demonstrated its use.

iDe Nepal team introduce the farmbetter application to the FFS participants

The weekly schedules including activities for a total of 20 weeks is presented in Annex 2, Table A2.

13. Reflections from the participants

Participating in a FFS with the integration of digital tools as an additional means of communication and exchange of information was a new experience for all the participants. They shared their experiences in various aspects of FFS, including working in groups, sustainable agriculture practices, and use of digital tools. The following are some of the reflection from the participating farmers:

a. Many participants expressed that working in a group was an enjoyable experience and that team work made their tasks less challenging.
b. As the participants were introduced to different sustainable agriculture practices, farmers realized the importance of considering agricultural practices that minimize adverse effects on the environment. For instance, the farmers acknowledged the value of soil testing, proper soil collection techniques, monitoring of moisture level, and appropriate application of fertilizer to maintain soil health.
c. The participants recognized the potential of using different digital agro-advisory services to access relevant agricultural information tailored to their specific needs, such as information on soil test, appropriate crop cultivation time, and market price, at the comfort of their home.

Participants actively explore the photo query feature of a mobile application and share their farm related problem with experts

d. In addition, the participants learned the possibility of using digital mediums to manage farm problems. For instance, they could share their real time queries by clicking photos and sending them to agricultural experts, contacting experts through audio and video calls, sending messages, and by watching relevant videos.
e. The participants shared that they were now aware about communicating with each other and forming groups in digital mediums such as Viber. Talking to each other, as well as contacting the local facilitator and agricultural experts was now easier.
f. Furthermore, many farmers shared that contacting agricultural experts and technicians through digital tools saved their travel time, which they would have taken to physically visit them otherwise.
g. However, some farmers suggested that in situations requiring immediate responses, experts and service providers should prioritize urgent queries, as delays could lead to negative implications.
h. The use of digital tools not only assisted the farmers but also helped the local facilitator to find appropriate solutions using mobile phone and internet when required.

14. Key learnings

Designing and implementing a FFS with an integration of DAS as a research activity was a new experience for the KU AgriPath team. It was with the help of

agriculture experts, local facilitator, national and local stakeholders, farmers, and service providers that it was a success.

FFS participants joyfully observe the flourishing wheat field, a reward of their hard work

The most important takeaways and learnings for the team have been provided below.

i. Hands-on learning is important while integrating DAS to farmer participants. Providing opportunities to ask questions and share their confusions with facilitators will enhance farmers' learning experience and have an improved understanding of using DAS.

ii. Integrating DAS in a collaborative environment such as FFS offers farmers an opportunity to learn collectively. For instance, both women and men from varied age groups were introduced to different DAS during the FFS, which they navigated and practiced together with the help of the local facilitators.

iii. It is important to consider 3Gs (Gender, Generation, and Geography), while designing a FFS.
    - Gender: It is important to train the facilitators to

Male and female participants explore newly introduced mobile-based application and engage in peer learning

provide gender related trainings to ensure they are aware and understand appropriate ways to communicate with both male and female farmer participants from different age groups.

- Generation: It is necessary to understand the needs and attitudes of the farmers belonging to different generations.
- Geography: FFS should not use a one size fits all approach. Information on the possible effect of farmers' agricultural practices on health, and climate change should be encouraged but it is necessary to contextualize such information on the basis of the local geography.

iv. There is a potential to integrate DAS and SAP together in a FFS and inform farmers through demonstrations. However, one of the major challenge is to encourage adoption of SAP. It is important to identify ways in which DAS can facilitate adoption of SAP.

v. There is a need of digital literacy training to the farmers. Even though the participants were eager to learn about DAS, not all farmers had the same level of understanding, knowledge and resources to use DAS.

15. Final words

This report has highlighted the process, experiences, and learnings of integrating DAS in FFS. The concept of integrating DAS in FFS is still in its early stages. It was possible for the KU team to implement it as part of its action research activity, because of the AgriPath project. We believe insights from such research and small scale initiatives will provide valuable guidance for future efforts to enhance the integration of DAS to FFS. Incorporating digital tools in agricultural extension approaches will play a key role in empowering smallholder farmers, as it provides them with better access to information, knowledge and resources, which can help farmers make informed decisions to improve their agricultural practices. However, this integration must be designed and implemented with farmers at the center, adopting a bottom-up approach that prioritizes their needs and inputs.

ANNEX

ANNEX 1: Details of the FFS

Table A1: Details of the Farmer Field School

Start Date	November 20th, 2023
End Date	May 12th, 2024
Country	Nepal
Province	Bagmati
District	Kathmandu
Municipality	Dakshinkali
Ward	08
Place	Simpane, Chhaimale
Name of Farmer Group	Jhamkeshwori Krishak Samuha
Participant Details	Total number: 26
	Female: 19
	Male: 07
Name of the local facilitator	Mr. Radha Krishna Chapagain Ward No. 08, Simpane, Chaimale Dakshinkali Municipality
AgriPath Team at Kathmandu University	Prof. Sagar Raj Sharma (Principal Investigator) Dr. Hritika Rana (Post Doc Fellow) Ms. Bristi Vaidya (PhD Candidate)

ANNEX 2: Weekly schedules of the FFS

Table A2: Schedules for twenty weeks of FFS

Week 1 - Schedule	
20th November, 2023 - Monday	
Time	**Activity**
11:00 am - 11:15 am	Creating an environment for the session, Attendance
11:15 am - 11:30 am	Game for group formation
11:30 am – 12:00 pm	Group and sub-group formation, prepare rules for FFS
12:00 pm – 01:00 pm	Prepare crop calendar, presentation on preparation methods according to the crop calendar
01:00 pm – 1:30 pm	Tea break
01:30 pm – 01:40 pm	Video display
01:40 pm – 02:30 pm	Collection of soil sample for soil test, knowledge on improvement of organic matter in the soil
02:30 pm – 03:00 pm	Review of participant's expectations and future programs

Week 2 - Schedule	
27th November, 2023 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Creating environment for the session, review of previous week
11:15 am - 11:45 am	Soil test
11:45 am – 12:00 pm	Group presentation on activities for soil test
12:00 pm – 01:00 pm	Resource map, importance of identification and preparation
01:00 pm – 1:30 pm	Tea break
01:30 pm – 01: 45 pm	Information on digital soil test and its use
01:45 pm – 02:30 pm	Information on seed quality, seed selection, seed production strength test and group work
02:30 pm – 03:00 pm	Participant's expectations, review of the day, and allocation of work for next week

Week 3 - Schedule	
4th December, 2023 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Creating environment for the session, task allocation
11:15 am - 11:45 am	Field boundary marking
11:45 am – 12:00 pm	Fertilizer preparation
12:00 pm – 12:30 pm	Demonstrate seed sowing methods
12:30 pm – 01:00 pm	Field assessment
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 01:45 pm	Preparation and information on resource mapping
01:45 pm – 02:30 pm	Seed production strength testing
02:30 pm- 03:00 pm	Daily review, expectations and assignment of task for the next week

Week 4 - Schedule	
11th December, 2023 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:30 am	Review
11:30 am - 12:30 pm	Identifying methods to assess soil water holding capacity and its importance
12:30 pm – 01:00 pm	Practical class on soil water holding capacity
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 01:45 pm	Brief information on agricultural apps (*SuperKrishak* & *GeoKrishi*)
01:45 pm – 02:00 pm	Information on *Kisan call center*
02:00 pm – 02:15 pm	Use and Importance of *Kisan call center,* information on it not incurring any charges (free) and practical class on its application
02:15 pm – 02:45 pm	Introduction and information on *Krishi Diary,* Information on its application
02:45 pm- 03:00 pm	Review of the day

Week 5 - Schedule	
18th December, 2023 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 11:30 am	Create virtual group through Viber app
11:30 am – 12:00 pm	Information on weather
12:00 pm – 01:00 pm	Information on organic and chemical fertilizers, methods to use and its importance
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:00 pm	Group work on preparation of organic fertilizer
02:00 pm – 02:30 pm	Group work on identification of the fertilizer sources
02:30 pm – 03:00 pm	Review of the day, participant's expectations and field assessment

Week 6 - Schedule	
25th December, 2023 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 11:45 am	Weather bulletin information through mobile app
11:45 am – 12:45 pm	Irrigation management, introduction on conservation of soil fertility, group work
12:45 pm – 01:00 pm	Methods to calculate appropriate amount of fertilizer
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Pesticide, labels on chemical pesticides, waiting period, and effects of pesticides
02:30 pm – 03:00 pm	Review of the day

Week 7 - Schedule	
2nd January, 2024 - Tuesday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 12:00 pm	Weather bulletin information

12:00 pm – 12:30 pm	Methods to calculate appropriate amount of fertilizer
12:30 pm – 01:00 pm	Practical class on pesticides and its use - completed by the participants
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Class on environment assessment
02:30 pm – 03:00 pm	Review of the day

Week 8 - Schedule	
8th January, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 1:00 pm	Group work on environment ecosystem assessment (3)
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Disease, pest, identification of harmful and beneficial insects, seed storage methods
02:30 pm – 03:30 pm	Review of the day and future plans

Week 9 - Schedule	
15th January, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 11:30 am	Presentation based on environment ecosystem group activity (3) conducted during the 8th week
11:30 am – 01:00 pm	FFS concept, definition and principle of IPM
01:30 pm – 02:00 pm	Group preparation for environment ecosystem analysis (4) and presentation
02:00 pm – 02:30 pm	Tea Break
02:30 pm – 03:00 pm	Review of the day

Week 10 - Schedule	
22nd January, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am - 12:45 am	Introduction to weed, management and reuse technique
12:45 pm – 01:00 pm	Revision on agriculture app
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Environment ecosystem analysis activity (5)
02:30 pm – 03:00 pm	Review of the day

Week 11 - Schedule	
29th January, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 01:00 pm	Introduction to market, market creation techniques, advantages and disadvantages, group activity

01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Special class on digital agriculture – GeoKrishi App
02:30 pm – 03:00 pm	Review of the day, work plan

Week 12 - Schedule	
5th February, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 11:30 pm	Agro-ecosystem Activity 5 – Preparation and presentation
11:30 am – 01:00 pm	Special class on IPM, pest and diseases
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:15 pm	Special class on market and marketing
02:15 pm – 02:30 pm	Special class on farmbetter mobile app
02:30 pm – 03:00 pm	Review of the day

Week 13 - Schedule	
12th February, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:15 pm	Information on agriculture weather advisory bulletin - activity
12:15 pm – 01:00 pm	Identification of important crop specific problems
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Agro-ecosystem activity – 6; disease and pest identification assessment
02:30 pm – 3:30 pm	Review of the days' activities and planning

Week 14 - Schedule	
19th February, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:15 pm	Preparatory activity on agriculture weather advisory bulletin
12:15 pm – 01:00 pm	Problem identification and sharing through GeoKrishi/Hello Krishi; Discussion on the feedback
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Agro-ecosystem activity – 7; Preparation and execution of weed management
02:30 pm – 3:30 pm	Review of the days' activities

Week 15 - Schedule	
26th February, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:30 pm	Refreshment class on taking photos/videos of farm problems and posting it on apps
12:30 pm – 01:00 pm	Proposal writing for agriculture plan

01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Agro-ecosystem activity – 8; field activity - weed management, ways of taking field photo/video and posting it
02:30 pm – 3:30 pm	Review of the day

Week 16 - Schedule	
4th March, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:00 pm	Seek solution for digitally shared problems
12:00 pm – 01:00 pm	Solutions/alternatives for digital challenges
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Agro-ecosystem activity – 9 and top dress
02:30 pm – 3:00 pm	Review of the day

Week 17 - Schedule	
11th March, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:15 pm	Seed selection and collection
12:00 pm – 01:00 pm	Role of natural enemies in pest and disease management
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Agro-ecosystem activity – 10
02:30 pm – 3:00 pm	Review of the day

Week 18 - Schedule	
18th March, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 12:15 pm	Refresher of previous weeks
12:00 pm – 01:00 pm	Discussion on farmer's day preparation
01:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Interaction with a representative from municipality agriculture section, prepared name list of seeds and field demonstration
02:30 pm – 3:30 pm	Activities for the following week and preparation for Farmer's Day

Week 19 - Schedule	
25th April, 2024 - Monday	
Time	**Activity**
11:00 am - 11:05 am	Participant's attendance
11:05 am – 11:15 am	Review
11:15 am – 1:00 pm	Online Session with Plant Pathalogist, Mr. Basistha Acharya, NARC
1:00 pm – 01:30 pm	Tea Break
01:30 pm – 02:30 pm	Ecosystem Analysis Activities, Presentation and insect observation
02:30 pm – 3:00 pm	Discussion for Farmer's Day

Week 20 – Farmers' Day Schedule	
12th May, 2024 – Sunday	
Time	**Activity**
10:30 am -11:20 pm	Observation of farm plots
11:20 am -11:25 pm	Welcome and objective of the program
11:25 am -11:55 pm	Reporting and experience of farmer field school
11:55 am -12:15 pm	Experience and learning of participating farmers
12:15 pm -12:30 pm	Certificate distribution
12:30 pm -12:45 pm	Special remarks
12:45 pm -12:55 pm	Remarks from special guests
12:55 pm -01:00 pm	Remarks from ward chair
01:00 pm -01:10 pm	Special remarks
01:10 pm -01:20 pm	Remarks from chief guest
01:20 pm -01:30 pm	Remarks from the program chair and program closing
1:30 PM	Tea and snacks

ANNEX 3: Crop calendar

A crop calendar was developed for wheat crop by participants as one of the activities during the FFS, which is illustrated in the Table A3 below:

Table A3 Crop Calendar for wheat prepared by the FFS participants

Crop	Month												
	Jan	Feb	Mar	Apr	May		June	July	Aug	Sept	Oct	Nov		Dec
Wheat	MS	MS	MS	MS	MS	H	×	×	×	×	P	P	PL	MS

*P – Preparation, PL – Plantation, Mid-season – MS, Harvest – H

According to Table A3, the months of October and November are used for land preparation. During this time, soil moisture is checked, and the land is irrigated as needed. One week post irrigation, fertilizer is applied to the land. Following that, the fertilizer is top dressed, wheat seeds are sown towards the end of November, and then the land is tilled.

The month from December to mid of May is allocated for mid-season activities. In December and January, the production capacity of the seed is assessed, land is irrigated and is top dressed. During February and March, the plots are evaluated for any pest and diseases infestation, and managed as needed. Accordingly, weeds are carefully managed, land is irrigated, and top dressed one more time. Irrigation, and management of pest and disease continue till the month of April and Mid-May, as required. During that time, crops are closely monitored, and when crops are ready, it is harvested in May.

ANNEX 4: Comparison of input and output between Farmer plot and FFS plot

Table A4: Input and Output Comparison of Farmer and FFS plots

Input	Farmer Plot				FFS Plot				Remarks
Seed	Swargadwari	BheriGanga	WK1204	Total	Swargadwari	BheriGanga	WK1204	Total	
Landsize (sq.mtr)	254	254	254	762	254	254	254	762	
Seed quantity (Kg.)	2.5	4	2.5	-	2.5	4	2.5	-	
Fertilizer (type and quantity)									
Gobar Mal (Compost) (Kg.)	300	300	300	900	300	300	300	900	
DAP (Kg.)	6.67	6.67	6.67	20	×	×	×	-	
Potas (Kg.)	3.33	3.33	3.33	10	×	×	×	-	
Urea (Kg.)	10	10	10	30	×	×	×	-	
Farming Technology used									
Soil Sample Collection for Soil Test	✓	✓	✓	-	✓	✓	✓	-	Methods such as V shape cut and zig-zag were demonstrated to and used by the farmers to collect soil sample for soil test.
Soil Test (Central Agriculture Laboratory)	✓	✓	✓	-	✓	✓	✓	-	
Soil Test (Manual Soil Test Kit)	✓	✓	✓	-	✓	✓	✓	-	
Row to Row Planting	×	×	×	-	×	×	×	-	Less dense than traditional sowing method
Irrigation (Flood)	✓	✓	✓	-	✓	✓	✓	-	
Soil Moisture Meter to test soil moisture	✓	✓	✓	-	✓	✓	✓	-	It was not a big concern. After irrigating the land, the upper part of the soil was observed to be dry when soil moisture was checked using the moisture meter, it was around 65 percent and did not require the land to be irrigated.
Weed Management *(Godmel/Manual)*	✓	✓	✓	-	×	×	×	-	*Bhang*/cannabis weed was found in Farmer's plot which needed to be manually removed. However, bhang weed was not observed in FFS plot. Normal weed *(Jhar)* were observed in FFS plot which was naturally regulated by the wheat plants during germination.

									One of the main reasons why *bhang* weed was found in farmer's plot was due to leftover seeds the plot.
Traditional Grain Moisture Check (Biting, rubbing or grinding)	✓	✓	✓	-	×	×	×	-	Traditionally, grain moisture is checked before harvesting to make sure that it is ready to be harvested. After harvesting, it is dried and then the moisture is checked again before storing it. Biting or grinding could cause wheat moth.
Use of Grain Moisture Meter	✓	✓	✓	-	✓	✓	✓	-	Use of grain moisture meter was new for the participants as they were observed to be surprised when its use was demonstrated
Weighing Machine	✓	✓	✓	-	✓	✓	✓	-	Traditionally, participants would either estimate or use traditional measuring tools - *Mana and Pathi.*
Traditional Weighing - *Pathi/Mana*	×	×	×	-	×	×	×	-	
Digital Technologies used									
Video via Laptop and Projector for soil sample collection for soil test techniques	✓	✓	✓	-	✓	✓	✓	-	
Presentation on pest and disease management	✓	✓	✓	-	✓	✓	✓	-	
Mobile App for Soil Information	✓	✓	✓	-	✓	✓	✓	-	
Mobile App for Weather forecast through mobile apps	✓	✓	✓	-	✓	✓	✓	-	
Mobile App for disease/pest management inquiry through DAS	✓	✓	✓	-	✓	✓	✓	-	
Viber Group	✓	✓	✓	-	✓	✓	✓	-	For farmers and facilitator to exchange information, problems and share updates

Pest/Disease Observed									
Weed	More	More	More	-	Less	Less	Less	-	*Bhang*/cannabis weed was found in Farmer's plot which needed to be manually removed. However, bhang weed was not observed in FFS plot. Regular weed were observed in FFS plot which was naturally regulated by the wheat plants during germination. One of the main reasons why *bhang* weed was found in farmer's plot was due to leftover seeds the plot.
Aphid	✓	✓	✓	-	✓	✓	✓	-	
Lady Bug	✓	✓	✓	-	✓	✓	✓	-	Lady bug not a pest but to show that it was observed and helped control aphid infestation
Black rust	×	✓	✓	-	×	✓	✓	-	Only one two cases observed which was managed manually
Rat	×	✓	✓	-	×	×	×	-	Rat infestation in 2 farmer plots was observed, because those plots were near water body and surrounded by bushes. In contrast, the FFS plot was situated in the middle of the field which discouraged the rats.
Pesticide (type and quantity)									
Jhol Mal (ml)	20	20	20	60	20	20	20	60	*Jhol Mal* is bio-fertilizer prepared by farmers during FFS.
Azadirachtin(Neem Based) *(ltr.)*	5	5	5	15	5	5	5	15	Was used to control aphid
G Sunami (Chemical) (*ltr.*)	5	5	5	15	×	×	×	-	Was used to control aphid. 30 ml G sumami was mixed in 15 ltrs of water. One bottle = 500 ml
Rat Cake (Ratol) in bread *(gm)*	☒	25	25	50	×	×	×	-	One ratol = 100 gm
Use of PPE Set	☒	☒	☒	-	×	×	×	-	PPE set was used while applying G-sunami in Farmer's plot
Time taken for Production (days)	161	164	169	-	161	170	170	-	
Yield (gm)	**1165**	**1151**	**1400**	-	**1514**	**1620**	**1575**	-	

ANNEX 5: Experiences as shared in the FFS journey video

The Farmer Field School journey was further captured in a video by Agriculture Information and Training Center (AITC), Nepal. The video titled '*Digital Farmer Field School conducted at Dakshinkali, Nepal by AgriPath, Kathmandu University*' is accessible to watch at https://youtu.be/2UnCKiTvBEQ?si=i9zcUAAlhJJYa4tA. Some of the excerpts from the video are shared below:

'Working in group is more fun than working alone and I realized that it also makes the work somewhat easier.....We also learned to make bio-fertilizer and used it. As a consequence, we have observed good result in the crop growth.'

'Soil testing and appropriate use of fertilizer is very important. Previously, we used to apply fertilizers in a haphazard manner. As a result, quality of soil in our village degraded.....we also discovered that we can diagnose diseases in our crops by clicking photo and sending them through mobile apps like *GeoKrishi* and *SuperKrishak*..... It would have been better if we had received swifter feedback.'

प्रा.डा. सागर राज शर्मा, प्रमूख अन्वेषक
Pro. Dr. Sagar Raj Sharma, Principal Investigator

काठमाडौं विश्वविद्यालय, एग्रिपाथ परियोजना
Kathmandu University, AgriPath Project

'We are currently running the AgriPath project at the School of Arts, Kathmandu University..... This research is being conducted in collaboration with the University of Bern, Switzerland, and it also involves partners in Africa and India. Kathmandu University has taken on the responsibility for this research in Nepal..... We all believe in the concept of *'Classroom to Community, Community to Classroom'*. If we cannot transfer the knowledge from the classroom to the community, it will not hold any value.'

AgriPath Project
Funded by:

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Implemented by

Consortium Partners: