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REVIEW ARTICLE

Farming Systems Research (FSR) in Nepal: A Review

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Abstract: Farming systems research (FSR) is important for addressing the aforementioned concerns. FSR uses a comprehensive approach to capture farm family behaviour in reaction to and interacting with its biophysical and socioeconomic settings as a technique. FSR is a method of creating suitable technologies in conjunction with farmers that is classified as action research. The purpose of this study is to introduce the distinctive qualities of Nepalese agriculture as well as the country's FSR evolution. First, clarify the characteristics of the diverse farming systems by agro-ecological region, then examines the constraints and potentials for each region based on previous studies. The second part of the paper deals with research system, tracing the evolution and development of Nepal's FSR, assessing the achievements. Finally, the paper concludes with identifying the constraints and future agenda for further development of FSR efforts in the country.
Keywords: Farming systems research, technique, agriculture, agro-ecological region, Nepal.

INTRODUCTION

Farming system concepts have increased the capacity to understand and provide assistance to small farm households throughout the world. A typical definition of farming system given by Joshi & Piya, (2021)is: "a unique and reasonably stable arrangement of farming enterprises that the household manages according to well defined practices in response to physical, biological, and socioeconomic environments and in accordance with the household's goals, preferences and resources." It involves the assessment of potentials considering physical as well as socioeconomic opportunities and constraints for the purpose of planning agriculture and sustainable use of resources (Adhikari et al., 2021; K. Bhattarai & Conway, 2021a; Chikanbanjar et al., 2021; Coppock et al., 2021; Rivera-ferre et al., 2021). The concepts of farming systems provide a means to understand the dynamic totality of agricultural development. This systems conceptual framework also provides a way of thinking about the systematic interdependence of both the internal and external components of the farming operations. According to Rayamajhee et al., (2021), farming systems are both units of analysis of agricultural production and methodologies for user-based agricultural research and development. He defines FSR as a methodology for conducting interdisciplinary, on-farm, user-based adaptive agricultural research targeting defined group of relatively homogenous farming system types characterized by similar constraints.

In Nepal's NARC, participatory agricultural research is primarily defined as research undertaken by a diverse research team with a systems view in close collaboration with farmers and extension workers. Recently FSR within the domain of outreach research in NARC has focused more on participatory, systems oriented and integrated approach to research and development (B. R. Dahal et al., 2021). Emphasis is laid on research and extension to work together with farmers in technology identification, verification and dissemination (B. R. Dahal et al., 2021).

AGRICULTURAL INPUT SUPPLIES

IMPROVED SEED

In Nepal, the utilization of crucial agricultural inputs is quite low. Improved seeds are mostly used in important crops like rice (50 %), maize (40 %), and wheat (40 %) (80 %). Furthermore, enhanced seed is replaced at a rate of less than 2% every year, compared to a rate of roughly 10% in the past. The principal source of seed supply in the nation is still farmer-to-farmer production and sale of seeds (K. Bhattarai & Conway, 2021b). Private sector seed supply and distribution is not well developed (Chaudhary et al., 2021).

FERTILIZERS

Nepal is one of the lowest fertilizer consuming countries in Asia with about 32 kg of plant nutrients consumption per hectare. Limited use of fertilizer is due to unavailability on time caused by market distortion resulting from inappropriate subsidy and pricing policies of the government (Krupnik et al., 2021). This low use is also as a result of poor adoption of improved technology and lack of irrigation facilities. Studies show that despite growing demand for fertilizers, the government's poor capacity to allocate the needed budget for fertilizer subsidies has caused the snowfalls in aggregate supply and imbalance use of nutrients (Thapa et al., 2021).

CREDIT

The use of agricultural credit for resource-poor farmers is critical for increasing farm production through increased input use and improved marketing of agricultural produce. It is also essential for creating market facilities (Kopp & Mishra, 2021). However, due to unavailability and high transaction costs of borrowing, use of credit for agricultural production through formal source is very low in Nepal (Devkota et al., 2021). Furthermore, because of the requirement of collateral, small-scale, resource-poor farmers have limited access to formal sources of credit (Panth et al., 2021). Therefore, it is reported that most of the credit (three-fourth of the total) is met though informal sources such as moneylenders, friends, and relatives (K. Bhattarai & Conway, 2021c).

POLICIES

Nepal has adopted open economic policy since 1991 which emphasizes development of commercial agricultural sector based on comparative advantage, specialization and market development (Chalise & Naranpanawa, 2021). However, there are a number of macro-economic and sectoral agricultural policies, which are not favorable for agricultural development (Holmelin, 2021). For example, agricultural inputs such as animal feed ingredients, spare parts of

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agro-based industries packaging materials for agricultural product have been subjected to high input tariffs (Shrestha et al., 2022). Similarly cold storage industries and processing facilities are not included in priority industries (R. Bhandari et al., 2021). Price support (floor price) for rice and wheat is announced too late to influence planting decisions of farmers.

INVESTMENT IN AGRICULTURAL RESEARCH

Being an agricultural country, public investment in agricultural research is very low despite its potential technological contribution to agricultural development and economic growth in Nepal (P. P. Paudel et al., 2021). Present investment is less than 0.2% of Agricultural Gross Domestic Product (AGDP) as against an international norm of at least l% of AGDP.

INSTITUTIONAL SETTING

The national agricultural research system, which was previously under the Department of Agriculture (DOA) and later under the National Agricultural Research and Service Center (NARSC), is presently under the Nepal Agricultural Research Council (NARC) after its autonomy in 1991. NARC has been mandated by His Majesty's Government of Nepal (HMG/N) as a prime institution to conduct agricultural research to meet the national objectives of increasing agricultural production and productivity. Its main objective is to generate relevant agricultural technologies for farmers; while the Department of Agriculture (DOA) and the Department of Livestock (DLS) are mandated to disseminate those technologies.

NARC has principally entrusted the responsibility of FSR to its Regional and area specific Agricultural Research Stations (R/ARSs). The mandate for national planning and coordination of FSR in NARC lies with the Outreach Research Division (ORD) which was previously merged and reorganized from then two independent divisions namely (i) the Farming Systems and Outreach Research Division and (ii) the Socioeconomic Research and Extension Divisions in 1992. Regional Agricultural Research Stations (RARSs) are mandated to conduct FSR based on the prioritized problems of the region. Similarly agricultural research stations (ARSs) are entrusted to conduct FSR based on the location specific needs of the clients in the command area (Sumit Sharma et al., 2021). In order to take the responsibility of running the farming systems program smoothly a multidisciplinary outreach research unit has been established at each R/ARS under the NARC.

Each R/ARS identifies agro-ecological domain for which on-farm research sites are established to conduct research based on the problems/potentials of each domain. On-farm or outreach research site is the center of the field activity for FSR of the each R/ARS with the involvement of extension agents and farmers. The detail of the organizational chart of the agricultural research systems is presented below (Figure 1).

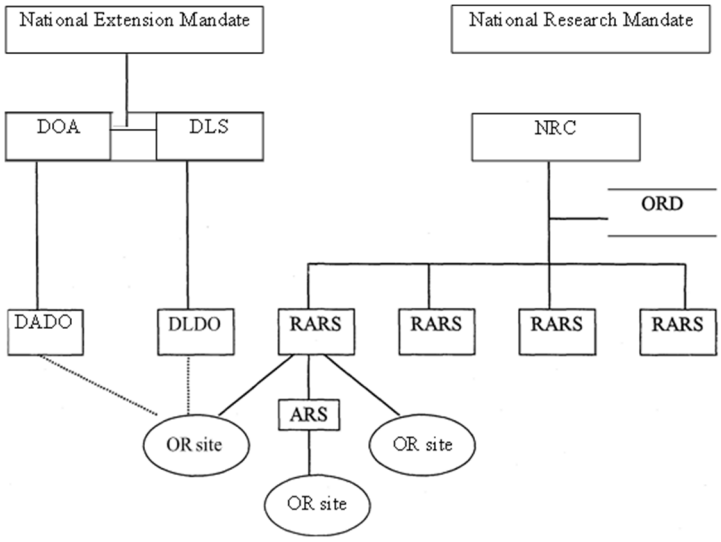

Figure-1: Organizational chart for agricultural research, extension and outreach / FSR Activities in Nepal

The potential technologies identified in the on-farm sites with the involvement of farmers are passed to extension services for further verification and dissemination in the large scale in extension command areas/pockets with the active participation of farmers at the district and Service Center level. In the process of producing technologies that are relevant to farmers, full participation of DOA and DLS as equal partners of NARC is imperative. However, this partnership at the higher level has not been so far made effective to increase agricultural productivity and solve the problems of farming community.

Evolution of FSR in Nepal

Agricultural research in Nepal began in the early 1960s, when agricultural research stations and farms were established in diverse agro-ecological zones (Begho, 2021). On-farm components, such as commodity-specific varietal assessment study, were present on these farms and stations (Choudhary et al., 2022; Fowler et al., 2021; Ghimire et al., 2021; Khanal et al., 2021; Nandwani et al., 2021). However, agricultural systems research did not begin until 1977, when the Integrated Cereal Project (ICP) at Agronomy Division, Khumaltar, Kathmandu, launched the Cropping Systems Program (CSP) with USAID financing. The Cropping Systems Research Sites program created six Cropping Systems Research Sites in diverse places around the Hills and Tarai to perform cropping systems research with farmer participation (B. Paudel et al., 2021).

On the basis of farmer input, cropping pattern experiments that mimic the real-world condition are planned and assessed in research locations (B. Bhattarai et al., 2021). Horticultural, livestock, and forest trees, in addition to crops, are major components of Nepalese agricultural systems, according to this CSP. As a result of this program's success, NARC established the FSR and Development Division (FSRDD) and the Socioeconomic Research and Extension Division (SERED)

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in 1985 to take a more holistic and integrated approach to systems research. These divisions were optional when it came to conducting FSR and bringing together researchers from diverse fields, such as cattle and forestry, to focus on farmers' special challenges (B. R. Bhattarai et al., 2021).
After the USAID-funded Agricultural Research and Production Project (ARPP) was terminated, these two divisions were consolidated into the Coordination and Special Project Division (CSPD), which was later renamed the Outreach Research Division (ORD). This ORD is currently in charge of planning, coordinating, and executing FSR in Nepal. From 1993 to 1997, the USAID-sponsored Agro-Technology Support Project (ATSP) funded farming systems-related research and outreach efforts in NARC. A brief overview of the FSR approach's evolution.

With the prevalence of small-scale, resource-poor farmers with various socio-economic and cultural values, Nepal's farming systems are complicated, diversified, and risky (Ojha et al., 2021). The FSR technique was developed to address the numerous production issues and possibilities faced by small-scale farmers who work in a variety of environments and express their needs directly. Outside technical and financial aid, particularly from USAID, was critical in justifying and distributing the principles of FSR in Nepal.

Table 1: Evolution of Farming Systems Research in Nepal

Period	Institution	Major Issues	Activities	Farmer Input	Achievement
1960s	Government research farms and stations	Commodity specific research	On-farm component trials mainly field demonstrations	Provide lands for trials and some feedback from demonstrations	General feedback and adoption of component specific improved teleology
1977	Integrated Cereal Projects (ICP) of the USAID	Cropping system research	Cropping pattern trials in selected research sites	Farriers consultation in designing on-farm cropping system trials	Realization of livestock and tree components in the farming systems in addition to crops
1985	Farming Systems and Socioeconomic Research Divisions supported by ARPP of USAID Until 1992	More holistic, inclusions of livestock and fodder tree components in the system research	Diagnostic surveys and on-farm trials in selected FSR sites	involvement in problem identification, designing and evaluation of on farm research in few selected sites	Adoption of new crop varieties, fodder trees and increase cropping intensity in selected FSR sites and also raised awareness of farmer oriented research
1992	NARC Autonomy CSPD establishment	FSR related work was at low profile	Some diagnostic surveys done for on-farmer research activities	Farmers consultation in some specific research activities	Coordination of FSR related activities continued
1994	Outreach Research Division at the center and Agricultural Research Stations in the regions / specific locations supported by ATSP (USAID) until 1997	Continuation of FSR work in many OR sites / agro-eco-zones and also more focus on the institutionalization of the systems approach	Agro-ecological zoning, problem identification, prioritization and establishment of on-farm site throughout Nepal.	Regular involvement and participation in designing, conducting and evaluation of research activities	Adoption of improved varieties, cropping intensity, new crops in the systems but continuation has been difficult due to lack of financial, human and logistic support

APPROACH

The FSR procedure has been accepted, modified and adopted to suit the local agro-ecological, socioeconomic and institutional environment of Nepal (Subedi et al., 2021). The research methodologies deal with the identification of constraints and opportunities, and the carrying out of research with farm household members in their farming system designed to reduce or eliminate the constraints and utilize opportunities to achieve their goals and preferences (Dhakal et al., 2021). The process is farmer-centered, and farmer input is used in all the steps, thus resulting in demand driven technology generation (Bajracharya et al., 2021). This method also facilitates continuous farmer-research-extension interaction covering mechanism for better linkage and information flow in either direction.

AGRO-ECOLOGICAL ZONING

The main purpose of agro-eco-zoning (AEZ) is to delineate geographical area into homogenous zones for conducting FSR, analysis, and development. The diversity of climate, landscapes and farming systems in Nepal is not conducive to a generalized planning formula for agricultural development (Pathak, 2021). Therefore, agro-ecological zoning is recently seen as an appropriate way to implement agricultural development programs, research targeting and location specific policy analysis (Paudyal et al., 2021). Delineation of unique agro-ecological zone in each region helps to identify agricultural potentials and make optimum use of their comparative advantage (Baral et al., 2021). It also permits comparison of existing farming systems and extrapolation of potential technologies in different locations having similar agro-ecological characteristics (Aryal et al., 2021).

Different studies have been undertaken in the past to define and delineate agro-climatic /agro-ecological zones for different regions Tarai and Hills) and districts of Nepal. However presently, mainly agro-ecological criteria such as climate, altitude, land types, hydrology, soils, vegetation etc. are used in Nepal for agro-eco-zoning process (Luintel et al., 2021). Among them land types, hydrology and soil based agro-eco-zones in Tarai and climate and altitude based in the Hills and Mountains have been commonly used for FSR and analysis.

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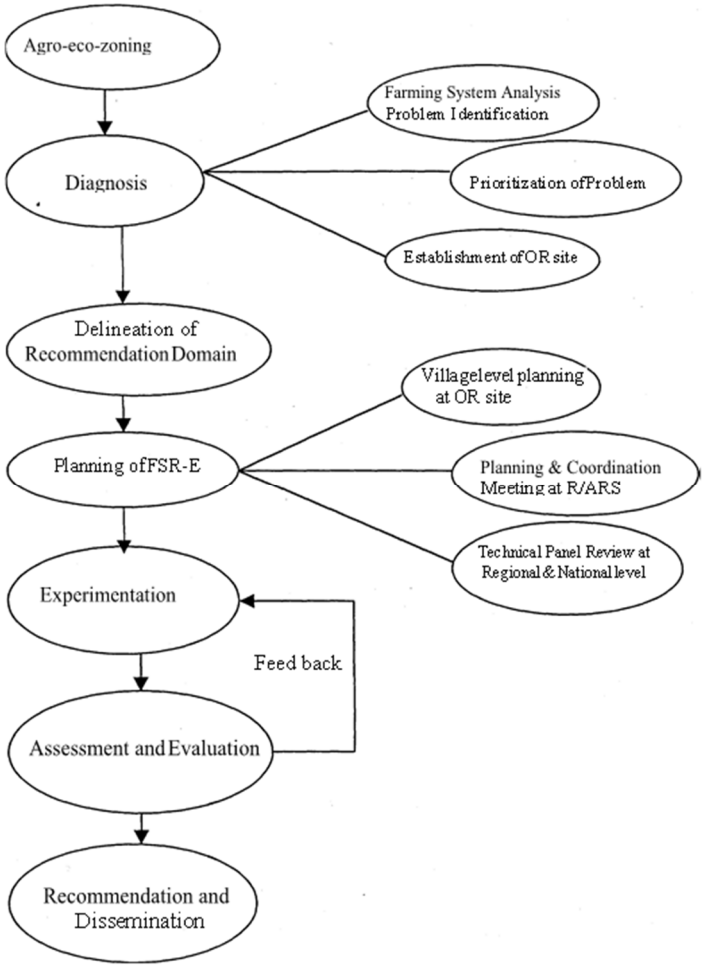

Figure 2: Steps in Farming Systems Research Approach followed in Nepal

Table 2: Agroecological zonation identified for Farming Systems Research in *Nepal-Tarai* Region (southern plains)

Agro-Ecological Zone	Drainage Name	Land types	Constraints to agricultural production
Lower wet land *(Khala, Khet, Agahani)*	Poorly drained Heavy soils	Wetland	Ponding in monsoon season
Mid-wet land *{Oshaniya Khetand Bhadaiya)*	Medium to poor drained	Upper wetland And mixed	Occasional ponding Flooding
Upland / Dry land *Bhita, Danda khet)*	Well drained Drought prone	Dry land fans	Dry soils, wind erosion
Forests mixed land	Well to rapidly drained	Foot slope fans	Sheet erosion and gullying
Flood prone land *(Bagar)*	Flood prone, poorly drained	Valley floor	Flood hazard

Source: NARC/ATSP (1993).

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Table 3: Agro-ecological zonation identified for Farming Systems Research in Hills and Mountains in Nepal

Agro-Ecological Zone Name	Climate	Altitude (ms1)	Land types	Agricultural potentials
River basins	Sub-tropical	600-1,200	Valley floor	Food grains and subtropical fruits
Lower Hills	Warm temperate	1200-2,200	Hill-side terraces slopes and	Citrus, temperate fruits, off-season vegetables
High Hills	Cool temperate	2,200-3,500	Steep slopes and terraces	Temperateur fruits and vegetables, seed potato
High Mountain	Alpine	3,500-4,800	Steep/flat highland	Livestock production sheep, yak cheese,
High Himal	Arctic	4800-	Snow peak	

Source: Adapted from G. Bhandari et al., (2021).

Important parameters that can be incorporated in the zoning exercise for detail farming systems analysis are socioeconomic and farm economics, market accessibility (road, infrastructure etc.), irrigation availability, farming potential etc. In the NARC, this will be proposed to be done in the future within a wider framework in order to establish farming systems and socioeconomic database and linking this with GIS technology application.

DIAGNOSIS OF PROBLEMS/POTENTIALS

Diagnosis is both initial step in FSR and a continuing activity throughout the process. The major objective of this step is to understand existing farming systems and diagnose key farmers problems including possible interactions, in order to develop some preliminary ideas on how to solve these problems (S. Dahal & Manandhar, 2021). It should also provide an adequate understanding of the variability in regional farming systems in order to facilitate the targeting of homogenous farming systems. This includes diagnostic surveys and workshops using Rapid and Participatory Appraisals of the selected agroecozones and farming systems. The major activities of these steps are:

(i) To understand agro-ecological, socio-economic conditions and farming systems of the area,

(ii) To identify major problems/constraints, potentials including possible interactions and interrelationships of the farming systems,

(iii) To prioritize problems using research prioritization workshops (RPW) with the involvement of different stakeholders such as farmers (resource rich, poor, women), extension workers and researchers from different disciplines. Problems identified by the diagnostic surveys are reviewed and grouped as researchable, non-researchable and policy issues (Table 8). Researchable issues are then ranked according to prevalence, frequency, severity and probability of successful solutions, and

Table 4: Ranking of researchable issues based on prevalence, frequency, severity, and probability of the successful solutions, Parwanipur, *Tarai* Region, Nepal

Researchable issues	Prevalence/ Frequency	Severity of problems	Probability of the Successful Solutions
Blast disease in rice	High	High	Medium
Zinc deficiency in rice	Medium	Medium	High
Stem borer in rice	Medium	Medium	Medium
Poor germination of rice seeds	Low	High	High

Source: Adapted from NARC/ATSP (1993).

(i) To select and describe the sites representing each agroecozones and recommendation domains to conduct further research and analysis based on listed problems and potentials from RPW.

(ii) Presently NARC has established 30 representative outreach research (OR) sites in different regions throughout the country to conduct regular on-farm /FSR based on the problems of each location and domain (see Table 10 and Map). These sites provide the venue for participatory system oriented research and technological intervention.

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Table 5: Outreach Research (OR) sites in various agro-ecological domains in Nepal

Name of OR site and district	Institutes or RARs	Agro-ecological Domains
Garamani, Jhapa	RARS, Tarahara	Rainfed Mid-Wet Land
Banigama, Morang	RARS, Tarahara	Partial Irrigated Mid-Wet Land
Bamangamakatti, Saptari	RARS, Tarahara	Irrigated Lower Wet Land
Dliangadi, Siralia	RARS, Tarahara	Rainfed Dry land
Sugauli, Parsa	RARS, Parwanipur	Irrigated Mid-Wet Land
Santapur,Rautahat	RARS, Parwanipur	Rainfed Upland
Bagawan,Bara	RARS, Parwanipur	Partial Irrigated Lowland
Simraungarh,Bara	RARS, Parwanipur	Partial Irrigated Upland
Shukranagar,Chitwan	ARS, Rampur	Rainfed Upland
Manahari, Makawanpur	ARS,Rampx	Partial Irrigated Mid Wet Land
Rajahar ,Nawalparasi	ARS,Rampw	Rainfed Upland And Mid Wet Land
Bankatti, Rupandehi	RARS, Bhairahawa	Lowland, Middle Land
Sanda, Nawalparasi	RARS, Bhairahawa	Rainfed Mid Wet Land
Barohia, Kapilbastu	RARS, Bhairahawa	Rainfed Lowland
Mohamadpur, Bardia	RARS, Nepalgunj	Rainfed, Partial Irrigated Lowland
Taratal, Bardia	RARS, Nepalgunj	Rainfed Mid-wet Land
Betahani, Banke	RARS, Nepalgunj	Partial Irrigated Lowland
Sundarbari, Dang	RARS, Nepalgunj	Rainfed/ Partial Irrigated Upland
Mati, Dolakha	ARS, Kabre	Rainfed Upland , Mid Hills
Khimti, RaineclAap	ARS, Kabre	Irrigated Lowland, River Basin
Bhuinirajmandu, Doti	ARS, Doti	Rainfed Upland Mid Hills
Banlek, Doti	ARS, Doti	Partial Irrigated, River Basin
Sahare, Shurkhet	ARS, Surkhet	Rainfed Lowland/Upland, Low Hills
Karendanda, Syangja	ARS, Malepatan	Rainfed Upland, Mid Hills
Bharatpokhari, Kaski	ARS, Malepatan	Rainfed Upland, Mid Hills
Talium, Jumla	ARS, Jumla	Partial Irrigated Lowland
Dillichaur, .Tumla	ARS, Jumal	Rainfed Upland
Dliusa, Dliading	ORD, Khumal	Partial Irrigated Upland
Cliapagaon, Lalitput	ORD, Khumal	Rainfed Upland and Lowland
Bageswori, Bhaktapur	ORD, Khumal	Rainfed Lowland and Upland

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DELINEATION OF RECOMMENDATION DOMAINS

The information obtained from agro-ecological zoning and diagnostic phase of FSR is used to identify tentative recommendation domains or target groups for whom the technology is recommended or developed. Recommendation domains are used to define and target homogenous group of farming systems, which have similar natural and socioeconomic circumstances and technological requirements (M. Sharma & Pudasaini, 2021). It assumes homogeneity of the group both agro-ecologically and socio-economically with reference to the farming systems constraints and technological requirements. The objective of delineating recommendation domains/target groups is mainly for research targeting and improving the efficiency and relevancy of the FSR. The recommendation domain concept is used throughout the entire process, including planning and assessment of experiments, and may be refined any time during the process (Subramanya et al., 2021). In Nepal, identification of relevant recommendation domain using socioeconomic criteria has not been undertaken so far due to resource constraints (scarcity of social scientists and finances) and difficulty in defining because of tremendous variability in farmers socioeconomic conditions. Furthermore, there is also general lack of strong understanding, recognition and importance of socioeconomic consideration in defining domain and technology design (Rijal et al., 2022). Thus, it has been more adopted for physical areas (e.g. where many of them are defined in terms of land types, climate, hydrology, altitude, vegetation etc.), and cropping systems. The followings are the recommendation domain for developing technology commonly identified in diagnostic phase of FSR in Nepal.

1. Irrigated lowland (rice-wheat or rice-rice-wheat system)
2. Partially irrigated lowland (rice-wheat system)
3. Rainfed lowland (rice-oil seed/legume system)
4. Irrigated upland (rice-vegetable system)
5. Rainfed upland (maize/millet or maize-1egume/oilseed)

Social, economic, and cultural factors such as farm size, market access, gender, ethnic identity have not yet been considered in defining recommendation domain and targeting the research.

PLANNING OF FSR

Planning of the FSR begins with the analysis of the problems identified and listed during research prioritization workshops. The potential options in relation to the prioritized problems are screened for technical feasibility, economic viability, risk considerations, compatibility with current farming system including availability of the resources and research success (D. R. Joshi et al., 2021). A bottom up participatory planning approach is being utilized every year in the NARC using different steps at different hierarchical levels, which arebriefly described here.

(i) Village Level Planning Workshops is conducted in selected on-farm sites with the participation of farmers, researchers and extension workers to draw main researchable issues and programs. Farmers and researchers together design, modify and evaluate the experiments in the small groups.

(ii) Planning and Coordination Meeting at the Agricultural Research Stations: Initial program drawn in the village level workshops are further scrutinized at the planning and coordination committee meetings with the joint participation of the researchers, extensionists and a few selected cooperator farmers of the command area. Prioritization of the researchable problems is done in small groups and verified in the plenum.

(iii) (iii) Regional Program Review: The multidi5ciplinary team in relations to regional problems and resource allocations reviews the research projects/programs developed through the planning and coordination meeting.

(iv) National Technical Panel Review Meeting: The projects screened through regional review is finally screened by a team of multidisciplinary and some time with multi-institutional experts based on the national priorities, research relevance and resources of the institutes before being finally approved by the NARC Board.

EXPERIMENTATION

The projects and activities (experiments, field studies) finally approved by the NARC Board is conducted at the farmers' fields at each of on-farm research sites of the domain. Farmers and local extension staff evaluate on-going farmers' field trials /experiments conducted at representative farmer fields. These activities are regularly monitored by organizing multidisciplinary team visits to on-farm research sites with the active participation of the extensionists. A broad range of agronomic and socio-economic data are collected during experimentation which provides realistic estimates of inputs used and the output produced.

ASSESSMENT

The results of the experiments are critically analyzed both through a biological and socio-economic point of view. It involves statistical, agronomic and socioeconomic criteria to assess the experimental results. Farmers' reactions are invariably taken into consideration while analyzing the experiment results. Farmers' field days and joint monitoring tours are held every major cropping season involving interdisciplinary research team, farmers and extension workers to assess and evaluate on-farm trials and get feedback from the clients. Based on farmers' reactions, treatments and experiments that are neither preferred nor accepted by the farming community are modified.

RECOMMENDATIONS RIND WIDER DISSEMINATION

The ultimate objective of FSR is to develop suitable recommendations for the target group of farmers in the given location. Since on-farm testing can only reach small number of farmers, the proven technologies should be extended and disseminated in the wider areas in the similar recommendation domains (Shaurav Sharma et al., 2021). Farmer preferred, bio-physically and socio-economically sound technologies are recommended for large—scale demonstrations and dissemination through extension departments, NGOs and other development agencies including private sectors in the similar recommendationdomains.

CONCLUSION

Therefore, the requirement for greater logistic assistance in terms of field transport, field goods, and working challenges in farmer circumstances are the key barriers to using the FSR technique. Furthermore, current incentive structures continue to privilege paper work and discipline research above solving farmers' real-world concerns. On-farm labour still has a low level of facilities and social status. As a result, FSR does not attract or encourage experienced and qualified researchers. It was noted that, following the cessation of donor-funded initiatives (USAID), Nepal could not maintain the same speed as previously due to logistical and budgetary restrictions, as well as limited career prospects. Due to disparities in the traditional working mandate (e.g., research for just technology creation, extension solely for dissemination), building up a combined working mechanism between extension and research employees is challenging. System research sits somewhere in the middle. In addition, there is no clear distinction between systems research and other types of study. Furthermore, due to

variations in understanding, working mandates, and government bureaucracy, developing formal working norms and processes between research and extension at the higher level has become challenging.

ABBREVIATION USED

DOA: Department of Agriculture
DLS: Department of Livestock Services
NARC: Nepal Agricultural Research Council
RARs: Regional Agricultural Research Station
ARS: Agricultural Research Stations
OR site: Outreach Research Site
DADO and DLDO: District Agricultural and Livestock Development Offices respectively.
ORD: Outreach Research Division

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CONFLICTS OF INTEREST

"The authors declare no conflict of interest".