ཚོང་དོན་སོན་ཐང་དང་འཚོ་ཐབས་ཡར་རྒྱས་ལས་འགུལ།
སོན་ཐང་དང་ནགས་ཚལ་ལྷན་ཁག

Commercial Agriculture & Resilient Livelihoods Enhancement Program (CARLEP)

Ministry of Agriculture and Forests

IFAD
Investing in rural people

Project Completion Report

Ministry of Agriculture and Livestock
Wengkhar, Mongar, Bhutan

June 2025

ཚོང་དོན་སོན་ཐབས་དང་འཚོ་ཐབས་ཡར་སེང་ལས་རིམ།
སོན་ཐང་ནགས་ཚལ་ལྷན་ཐག།

Commercial Agriculture & Resilient Livelihoods Enhancement Program (CARLEP)

Ministry of Agriculture and Forests

IFAD
Investing in rural people

Commercial Agriculture Resilience and Livelihood Enhancement Programme (CARLEP)

Project Completion Report

IFAD Loan: 2000000627
IFAD Grant: 2000000838
ASAP grant: 2000000872

Ministry of Agriculture and Livestock
Wengkhar, Mongar, Bhutan

June 2025

Acknowledgements

The study team would like to express our gratitude to the project management team of CARLEP as well as all other stakeholders whom we have met and interviewed during the study period and who have generously provided their views and opinions on the project interventions and the benefits derived through the project.

We would like to thank all the focal officials in the Dzongkhags and Gewogs who all provided requested information and support during the study period. Special thanks to Mr. Norbu, Project Coordinator, CARLEP, who has provided the assistance for field consultations by writing to all relevant stakeholders. Assistance was also provided from both CARLEP and relevant agencies in providing all necessary information required for the study.

We would like to acknowledge all the individuals involved in the preparation of this report. We are very much thankful to all members as well as individuals involved in this study.

The cooperation and support provided by all the individuals are highly appreciated.

CURRENCY EQUIVALENTS

Currency Unit Ngultrum (BTN) *

USD 1.00 = BTN 83.00

*The Bhutan Ngultrum (BTN) is pegged with the India Rupees (INR)

WEIGHTS AND MEASURES

International metric system, unless otherwise mentioned, and except for:

1 kilogram = 1000 gm

1 kilometre = 0.62 mile

1 metre = 1.09 yards

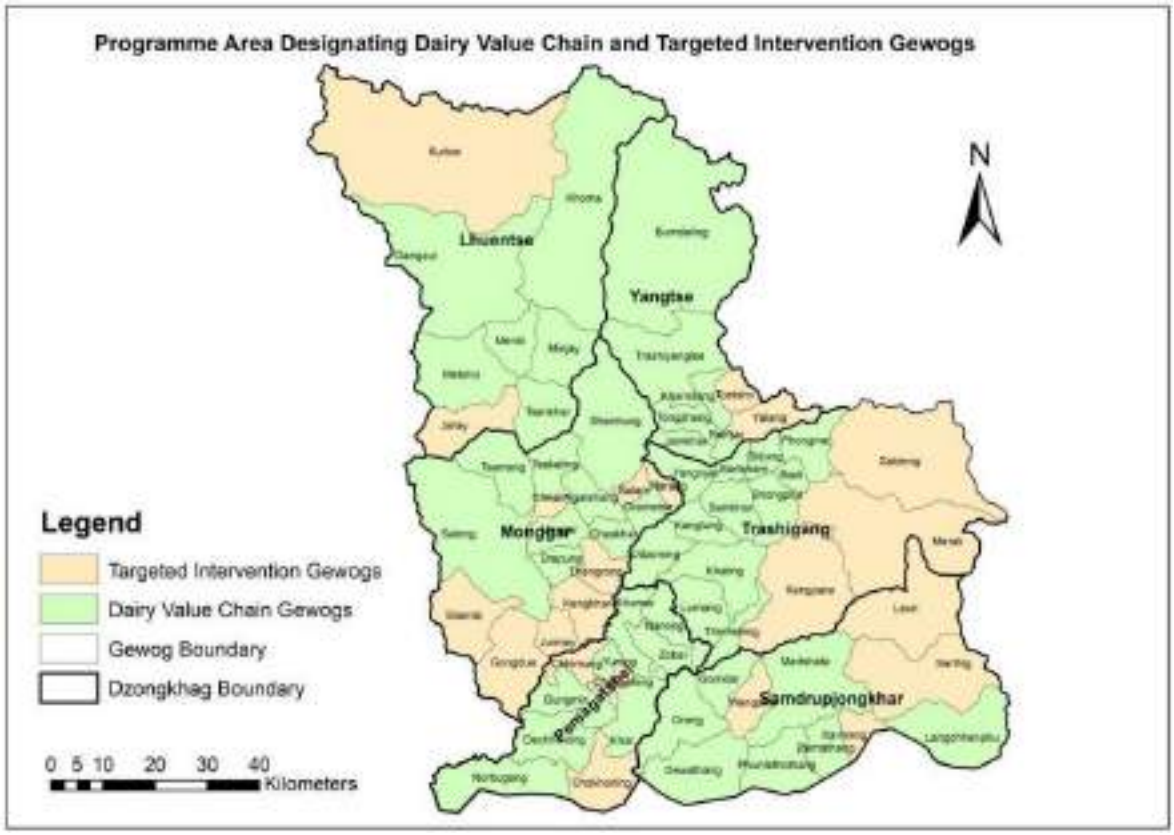
1 square metre = 10.76 square feet

1 acre = 0.4047 hectares (ha)

1 hectare = 2.47 acres

1 Langdo = 1400 m2

Figure 1: Map of the project target area



Project at a glance

Executing Agency: Ministry of Agriculture and Livestock (MoAL)

Implementing Partners: Six Dzongkhags & concerned Gewogs, Regional Agricultural Marketing Cooperatives and Office (RAMCO), Agriculture Research and Development Centre (ARDC) Wengkhar, Regional Livestock Development Centre (RLDC) Kanglung and Koufuku International Limited (KIL) Chenery, Trashigang

Overall program implementation: Coordinated by the Office of Programme Management (OPM) based at Wengkhar. The OPM is supported and guided by the National Programme Steering Committee (NPSC) at the national level and Regional Programme Implementation Committee (RPIC) at the regional level. The programme is also supported by one focal officer at the Policy and Planning Division (PPD) and one focal accounts officer at the Administrative and Finance Division (AFD) of the Directorate Services in liaising with the RGoB and other external agencies at the national level.

Project Objective: The goal is to reduce poverty by sustainably increasing the income of smallholder producers by way of commercializing agriculture production. The overall development objective is to increase returns to smallholder farmers through climate-resilient production of crops and livestock in nationally organized value chains and marketing systems.

Key dates:

IFAD approval	Signing	Effectiveness	Start of project	Original Completion	Actual completion
7/9/2015	11/12/2015	11/12/2015	4/3/2016	31/12/2022	31/12/2025

Number of beneficiaries:

	Total	Direct	Indirect	Women	
Target	28,975 HHs	7,115	21,860		
Achievement	153,905 HHs			51,441	

Budget and Expenditure:

Sources of Fund	Total project budget (million)		Expenditure till FY 2023-24 (million)			
	USD	BTN	USD	BTN	Progress % (USD)	Progress % (BTN)
Grant I	22.238	1,624.564	17.293	1,271.643	77.76%	78.28%
Grant II	14.998	1798.248	13.097	1019.757	87.32%	56.71%
Loan I	20.587	1491.089	16.039	1170.947	77.91%	78.53%
Loan II	14.821	1158.508	12.947	1008.024	87.36%	87.01%
RGoB	20.242	1458.105	15.592	1133.648	77.03%	77.75%

ASAP	23.847	1764.565	18.797	1401.784	78.82%	79.44%
Beneficiary contribution	0.892	58.395	0	0	0.00%	0.00%
FCBL contribution	3.394	223.608	0.028	1.792	0.82%	0.80%
Total	**121.019**	**9,577.082**	**93.793**	**7,007.595**	**77.50%**	**73.17%**

Project financing details

Initiating institution	IFAD
Borrower	Royal Government of Bhutan
Executing agency	Ministry of Agriculture and Forests
Total programme cost	USD 31.59 million+USD11.281 million=USD42.846 million
IFAD loan	SDR 5.89 million (about USD 8.27 million)
IFAD grant	SDR 0.76 million (about USD 1.06 million)
Adaptation for small holder agriculture programme (ASAP) grant	SDR 3.58 million (about USD 5.02 million)
Financing gap	USD 6 million
Terms of IFAD loan	Maturity period of 25 years, including a grace period of 5 years, with interest at a fixed rate of 1.25 per cent plus a service charge of 0.75 per cent per annum
Cofinancing amount	USD 4.81 million
Contribution of borrower	USD 5.77 million

Acronyms and abbreviations

AI	Artificial Insemination
ALD	Agriculture Land Development
AMEPP	Agriculture, Marketing and Enterprise Promotion Programme
AOS	Annual Outcome Surveys
ARDC	Agriculture Research Development Centre
ASAP	Adaptation for Smallholder Agriculture Programme
AWPBs	Annual Work Plans and Budgets
BAIL	Bhutan Agro Industries Limited
BRECSA	Building Resilient Commercial Smallholder Agriculture
BTN	Bhutanese Ngultrum
CAHWs	Community Animal Health Workers
CAITs	Community Animal Insemination Technicians
CARLEP	Commercial Agriculture and Resilient Livelihoods Enhancement Programme
CSV	Climate Smart Villages
DAMC	Department of Agriculture and Marketing Cooperatives
DPA	Department of Public Accounts
DSF	Debt Sustainability Framework grant
FCBL	Food Corporation of Bhutan Limited
FDGs	Focus Group Discussions
FYP	Five Year Plan
HHs	Households
IFAD	International Fund for Agricultural Development
KIL	Koufuku International Limited
KM	Knowledge management
LUC	Land Use Certificate
MAGIP	Market Access and Growth Intensification Project
MoAL	Ministry of Agriculture and Livestock
MoF	Ministry of Finance
MTR	Mid Term Review

NPSC	National Programme Steering Committee
PCR	Project Completion Report
PLAMs	Planning and Monitoring System
PMO	Project Management Office
PPD	Policy and Planning Division
RAMCO	Regional Agriculture Marketing and Cooperatives
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resource
RPIC	Regional Programme Implementation Committee
SECAP	Social, Environmental, and Climate Assessment Procedure
USD	US Dollar
VVCP-E	Vegetable Value Chain Programme in the East
WHM-1	Wengkhar hybrid maize-1
WUAs	Water User Associations

PCR rating table

Project name: Commercial Agriculture and Resilient Livelihoods Enhancement Programme	
Project ID: 1100001739	
Board approval date: 7/9/2015	
Entry into force: 11/12/2015	
Project completion date: 31/12/2025	
Loan closing date:	
IFAD loan and grant (USD million): USD 8.27 m and USD1.06 m	
Total project financing: USD 31.59 million+USD11.281 million=USD42.846 million	
Implementing agency: Ministry of Agriculture and Forests	
Criterion	**PCR Rating**
International criteria	
– Relevance	6
– Effectiveness	5
– Efficiency	5
– Sustainability	5
IFAD-specific criteria	
– Innovation	5
– Gender equality and women's empowerment	5
– Scaling up	4
– Environment and natural resource management	5
– Adaptation to climate change	5
– IFAD's performance	5
– Government performance	5
Overall project achievement:	**5**

Note: PCR Rating Scale
6: Highly satisfactory, 5: Satisfactory, 4: Moderately satisfactory, 3: Moderately unsatisfactory, 2: Unsatisfactory, 1: Highly unsatisfactory

Table of Contents

1. Executive Summary

CARLEP is a project initiated by the Royal Government of Bhutan (RGoB) and the International Fund for Agricultural Development (IFAD) which started from 11th December 2015 for the initial period of seven years from 2016 to 2022 but was extended to 31st December 2025 with additional funding. The total budget of the project is USD 42.846 million which includes USD 20.615 million from IFAD, USD 11.342 million from the Government of Bhutan, USD 5.022 million from the ASAP trust fund, US$ 2.982 million from Beneficiary Contributions and USD 0.407 million from the Private local sector. Out of the total IFAD funding, USD 14.27 million was provided as loan and USD 6.096 million as grant. Then the additional financing of USD 10.28 million was loan and USD1.0 million as Debt Sustainability Framework grant (DSF).

From the RGoB, Ministry of Finance (MoF) is the nodal agency to review and monitor the programme with a designate focal officer of IFAD in the Department of Treasury and Accounts responsible for coordinating with PMO/MoAL and IFAD for smooth fund flow, disbursements, preparing consolidated financial progress reports, clearing Withdrawal Applications and facilitating operation of the Designated Accounts. The Ministry of Agriculture and Livestock is the Lead Programme Agency with overall responsibility of the programme to provide policy guidance and direction. The overall responsibility of project implementation is the Programme Management Office (PMO) in Mongar under the direct administrative control of Secretary, MoAL.

The goal is to sustainably increase smallholder producers' incomes and reduce poverty through commercialization of production by programme households. The programme has four components as follows:

Component 1: Market led Sustainable Agricultural Production (USD 17.34 million)

Component 2: Value Chain Development and Marketing (USD 11.6 million)

Component 3: Institutional Support and Policy Development (USD 0.526 million)

Component 4: Programme Management

The programme is implemented in the six eastern dzongkhags of Lhuentse, Mongar, Pemagatshel, Samdrup Jongkhar, Trashigang and Trashiyangtse to build sustainable agricultural production and strengthen vegetable and dairy value chains. The programme was also to support rice production through enhanced water use efficiency and climate-resilient irrigation systems in the four high potential dzongkhags of Mongar, Pemagatshel, Samdrup Jongkhar and Trashigang and production of maize in all eastern dzongkhags. The adoption of an integrated farming system has the potential to produce additional commodities such as, fruits, wheat/cereals, buckwheat, barley, millets, pulses, oilseeds, tuber crops and fodder, for which the project aimed to support for increased smallholder diversity and resilience. Backyard poultry (chickens and ducks) and piggery production was also supported as part of an integrated farming system, based on local conditions, demand and resource availability. The project targeted to work with 21,860 HH with about 144,875 beneficiaries including indirect beneficiaries access to climate resilient farming practices. The project follows an inclusive approach to include all households living in a particular community but the priority was on the most vulnerable poor and smallholders for the allocation of programme

activities and benefits. Active involvement of women as well as youth and dealing with specific opportunities and challenges concerning them was the priority of the project.

Relevance

Project was designed in line with RGoB's 11th Five Year Plan where poverty alleviation and social development (reaching the unreached) were the overarching themes. It was to contribute towards expansion of agriculture service outreach to the remote and vulnerable populations and to increased resilience of smallholders to climate change and shocks as per the key objectives of the 11FYP. The programme also conforms to IFAD's target policy of reaching the rural poor and the strategic framework of empowering the rural poor, men and women alike, to improve their incomes and food security. The programme aimed to provide support to poor subsistence farmers in remote geographies to enhance agricultural production and opportunities to market their produce through an organized marketing system, thereby improving their livelihood.

Accordingly, the objective of CARLEP is relevant and is in line with the main government policies and strategies including those of the 12th Five Year Plan (FYP) and the present 13th FYP of the Royal Government of Bhutan. The activities implemented under CARLEP have strong relevance to the national goal of transforming the agricultural sector from subsistence-based agriculture into a sustainable value chain market-driven productive sector. CARLEP has successfully introduced several initiatives that have transformed the lives of smallholder farmers in eastern Bhutan, including mushroom production, fruit intensification, fallow land conversion, dryland irrigation and dairy value chain development.

Effectiveness

The project has demonstrated effectiveness in transforming eastern Bhutan's agricultural landscape by reaching 33,003 households (HHs) surpassing the target by 114% with strong gender inclusivity reflected in 52% female-headed household participation. The project's impact is evident in its successful transition of subsistence farming into profitable, market-oriented enterprises. The project's effectiveness is particularly visible in its integrated approach to value chain development. In the dairy sector, farmer groups have evolved into successful enterprises, with processing units like the Koufuku International Limited (KIL) and several community-based processing groups providing assured markets for smallholder dairy farmers. Similarly, vegetable producers have established reliable market linkages with schools and institutions. This commercialization has led to tangible increased in household incomes and improved food security. The establishment of climate-smart villages and preservation of indigenous stress-tolerant crop varieties have enhanced community resilience while maintaining agricultural biodiversity. The project has been very successful in building scalable models and approaches for agricultural development. Evidence of this effectiveness can be seen in the widespread adoption of improved practices, the emergence of successful agri-enterprises, and the strengthening of local value chains as highlighted in the case studies given in the annexure.

Gender equality and empowerment

The project explores and facilitates the promotion of need-based gender-friendly farm machinery, technologies, equipment & tools such as chaff cutter, corn sheller, quinoa de-husking, protected agriculture, electric dryers, electric fryers, weighing and sealing machine, Flexi-biogas, mini-power tillers, and also facilitate the promotion of efficient water use technologies such as drip irrigation, sprinkler, and automated irrigation to ease the burden of women farmers and enhance

production. Project also supported the formation of women's groups to ensure active participation of women in project related activities, decision-making bodies and committees. Likewise, the programme promotes a proportionate representation of women beneficiaries in training and capacity development programmes. Moreover, the development of thematic knowledge products related to gender and women empowerment is also given importance and emphasized in gender mainstreaming.

Climate change adaptation

CARLEP implemented Climate Smart Agriculture (CSA) strategies across the project area, integrating climate adaptation considerations from the planning stage of each infrastructure project. Further to address water scarcity exacerbated by climate change, project introduced multipurpose water tanks that serve both drinking and irrigation needs during dry periods, as well as rainwater harvesting systems. Efficient irrigation technologies, including drip and sprinkler systems, were adopted in greenhouses under protected agriculture practices. Project also introduced dryland irrigation, a novel approach in the region, enhancing water availability in previously underutilized areas. Furthermore, pipe-based irrigation systems for wetlands were carefully aligned to avoid landslide-prone and erosion-susceptible zones, ensuring long-term sustainability. The project's ambitious million-fruit tree program and fruit intensification initiatives, complemented by the hazelnut program, contributed significantly to carbon sequestration. The project also somehow attributed to natural carbon sinks with the fallow lands of 62,841 acres (39% of dryland and 5,729 acres 33% of wetland) across six Dzongkhags. These areas, covered with vegetation ranging from bushes to trees, not only prevent soil erosion but also enhance biodiversity and provide wildlife habitat, demonstrating how even unused agricultural land can deliver valuable ecosystem services under proper management.

Environment and natural resource management

Project has made substantial contributions to natural resource management across eastern Bhutan through its integrated and innovative approaches. It has effectively supported land development programs and water management technologies through ARDC, notably implementing dryland irrigation through piped networks and smart irrigation systems in orchards to reduce erosion and optimize water use. The project's biogas initiative has delivered multiple environmental benefits - reducing pressure on forests by decreasing firewood extraction, while the resulting bio slurry provided organic nutrients for vegetable and fruit production. Project has further promoted sustainable soil management through vermiculture, biochar, and bokashi production, successfully commercializing organic manure production. The land development scheme, particularly dryland terracing, has both enhanced productivity and prevented soil erosion. The introduction of improved fodder management practices, including silage making and treatment of crop residues, has helped to reduce grazing pressure on forests. There is improvement of natural resource base in the project target area and the pressure on the environment has been reduced. Project also supported and promoted hygienic cow sheds and fodder production in fallow and marginal land through supply of fodder seeds and fodder conservation through silage making and treatment of paddy/maize straws – thus reducing grazing pressure on the forests.

Social, Environment, and Climate Risks/Impact and Mitigation

The project's interventions have factored in social considerations and risks to ensure the broad inclusivity of its initiatives. CARLEP, driven by a commitment to environmental sustainability,

actively advocates for eco-friendly agricultural practices among farmers, including the promotion and upscaling of bio-fertilizers and pesticides, as well as the promotion of vermicompost. Pressure on forests has been reduced by fostering fodder production and implementing stall-feeding practices. The project's emphasis on climate adaptation has been manifested in the establishment of climate-smart villages. Support is channeled into critical activities such as greenhouses and the adoption of efficient irrigation techniques, alongside the promotion of climate-resilient crop varieties. The climate-sensitive design principles have been meticulously integrated into all infrastructure development, underscoring the project's holistic approach to climate resilience. The project has developed a comprehensive Social, Environmental, and Climate Assessment Procedure (SECAP) by identifying key concerns and array of measures aimed for mitigation.

Targeting and outreach

Project has surpassed its household outreach target of 141,562 with 153,905 households (women-headed household of 16,015 against the target of 14,486) in the six Dzongkhags. The project has largely delivered on its target strategy objectives, particularly in reaching women-headed households and vulnerable groups. The project monitors target performance through its M&E system and Annual Outcome Surveys and undertaken corrective measures, mainly through youth engagement. For example, support for mushroom enterprises have shown 100% adoption rate among trained youth, and engagement in agricultural marketing. The project also promoted youth participation in dairy processing units and as market aggregators, roles that better align with youth interests in business and technology while maintaining their connection to agriculture. The project maintains its focus on supporting vulnerable households through targeted interventions. Additionally, ARDC Wengkhar collaborated with Tarayana Foundation to establish a new climate smart village providing support for organic soil fertility management, dry land irrigation, and heat tolerant vegetable seeds. The project has already established 13 Climate Smart Villages benefiting 344 households and has supported 21,515 households in building climate change resilience.

Innovation

The programme supported various innovations such as the lead farmer model for agricultural development, animal health service models, an e-agriculture platform, permaculture approaches and linking smallholder market development to the Bhutan commodity exchange. All of these activities are not new but their integrated application through the proposed programme is innovative in nature. Linking technical innovation with the development of new models is a significant innovation in Bhutan such as the smart irrigation system.

One area of innovation is that of green house where ARDC Wengkhar have come up with modified version to address the issues of excessive heat in traditional greenhouses. The modified greenhouse consists of 30 x 5 m green house with increased height to mitigate heat buildup and enhance crop growth with advanced features such as trellising systems made of durable MS tubular rods and GI wire, and automated irrigation systems. The main focus of these greenhouses is to facilitate the cultivation of tomatoes and chilies, especially during the off-season.

Another activity was hot callusing technology (HCT) to enhance walnut propagation which was introduced to private nursery operator at Mongar on cost sharing mechanism after its successful implementation in Drepong with a success rate of 76%. The objective is to increase the graft success rate of walnut seedlings, thereby boosting income through the sale of high-value seedlings.

Scaling-up

Project stands ready for significant scaling-up through a series of impactful initiatives that have garnered enthusiastic participation from various stakeholders, including youth, women, farmer groups, local authorities, aggregators and traders. These initiatives encompass a wide array of interventions, such as protected horticulture, agricultural processing, business-to-business linkages, and dairy farming, with the latter being bolstered by the reliable support of Koufuku International as a stable outlet for fresh milk. Project demonstrated its unwavering commitment to engaging and empowering the youth through targeted investments, including mushroom production, fallow land conversion and support to aggregators. Another compelling indicator of scaling-up potential lies in the discernible adoption of its lessons and best practices by other development projects in Bhutan by including project activities in the government plans and programmes with specific budgets to allow for replication and scaling up.

Further, there is potential to scale-up through strengthening PPP model (CARTLEP's successful collaboration with Koufuko International Limited and BAIL) which demonstrates how structured partnership can create a sustainable marketing system. Similarly, the success of upland paddy cultivation with the introduction of Khangma Maap variety transformed local food security, offering important lessons for expanding Bhutan's rice self-sufficiency. The success of the Eastern Agriculture Marketing Cooperative (EAMC), the first of its kind in Bhutan, demonstrates the power of well-structured aggregation systems in transforming rural marketing. EAMC provides input and cash to farmers in advance, as well as advisory services to respond to market demand. Additionally, EAMC establishes forward market linkages through efficient transportation networks and institutional buyers. This comprehensive approach has proven effective in enhancing farm viability and should be institutionalized in national agricultural development programs.

Project efficiency

The project has well progressed in term of financial expenditure by spending about 77% of total budget (in USD) as of 2024. The total programme cost was estimated at US$31.59 million over seven years, including contingencies. There is almost equal distribution of expenses for all the work heads. Even in terms of four project components, the percentage expenses are around 80% as of 2024.

Immediate benefits include increased vegetable and dairy production, greater use of sustainable agricultural practices, increased access to extension and market information, sustainable extension services, market access through consolidation of production, enterprise establishment and greater employment opportunities. Indirect benefits include enhanced rural employment, strengthened climate resilience and improved household nutrition. Improved farming practices resulted in productivity increase in a range of 30% and 40%. The IRR is calculated for all the overall project. Adoption rate of each farm enterprises is estimated to range between 52% and 90% with an average of 63%. All crop and farm models analysed are profitable, yielding positive net present value. Economic analysis of the programme based on financial models and using economic prices shows it to be profitable, with an estimated net present value of Nu.3,198.99 million and an internal rate of return of 13.12 per cent at a discount rate of 10 per cent.

Lessons and knowledge management

The project has yielded several key lessons such as importance of market-oriented agriculture, value of climate-smart farming practices, and the need for robust value chains. Project also highlighted the significance of community participation, capacity building, and the integration of lessons learned from previous projects. The kind of support provided in complete package for value chain has led to development of self-sustaining cluster-based production and marketing, and for more income and assured access to market for each actor of the value chain. The increased production and income in the previous season have also supported to enhance the productivity in the subsequent season of farming, due to more cash income with the farmers for purchasing other inputs (like seeds and fertilizers) for growing the vegetables or cereals. In fact, increased in income of smallholding farmers has very wider impacts on the incremental change on the household's assets, community involvement and influence on decision making process at the community level, and in development of secondary and tertiary markets.

Success and sustainability of a group and/or cooperative is very much connected with the understanding and sense of ownership members have with respect to their enterprise. It was also learnt that strong management, access to proper equipment, and market linkages are crucial for sustainability. Community collaboration has boosted productivity and resilience. Thus, with timely support from the project, conducting practical training and timely budgeting are essential for smooth implementation and sustainability of the project.

CARLEP utilizes Knowledge Management to improve decision-making and performance in commercializing agricultural production and increasing smallholder incomes. Overall, the project has adopted a good system of documentation and sharing of knowledge and lesson learning with stakeholders. These lessons learning have been documented in trimester and annual report of the project. The project has published news bulletins regularly. Some of the learnings of the project have been published in well-read (face book pages) and nationally widely circulated daily newspapers (such as Kuensel).

Conclusion and recommendations

The CARLEP has supported investments in several value chain actors for both vegetable and dairy including establishment of infrastructure, input supplies and facilitated processing units. These investments have huge impact in strengthening value chain for both dairy and vegetables with high scale multiplier effects not only in the local communities but also to the Dzongkhags and the nearby areas in the region.

a) The market system, infrastructure development and business support to these tertiary level trading and agri-business needs to be further supported and facilitated for long term sustainability and for their effective functioning.
b) There is a need of setting up some sort of a mechanism in the CARLEP areas for continuously spending for maintenance of physical infrastructure by taking support through the project or outside of project domain. Value chain groups are to be supported to establish a kind of trust fund by taking certain percentage of payments received by the producers.
c) Support for value adding processing of some of the products to fetch better price and income. Accordingly, there is a need to provide support on the processing part so that the agri-business activities get further intensified in the areas.

d) Now with the assured market of milk to the KIL, there is demand for higher volume of milk where farmers are in need of continuous supply of fodder throughout the year. Hence, if the dairy production promotion is linked with other fodder development initiatives, or also with forest-based livelihood development activities, and with community forestry programme, then this will complement the cattle rearing activity of the project.

e) In an effort to create opportunities for youth in rural areas, the Government has developed the Land-use Certificate Programme (LUC), with the objective of offering land to youth to enhance productive use of land; encourage next generation farming through farm mechanization and large-scale production to promote enterprising farming; and to enhance rural economy. CARLEP has tested this LUC through supporting youth in investing on the land offered by the Government. However, several constrains were identified to negatively impact the progress of the activities planned. Owing to these, CARLEP's future investment decisions must be looked at from the prism of strategic land location, adequate farming facilities, interest of the youth and their co-investment capacity to ensure efficient resource allocation as well as long-term engagement and success.

f) The dairy value chain model linking producers to the Koufuko International Limited (KIL) dairy plant based in Trashigang has been a successful model in the region. KIL serves as an assured market for fresh milk produced by the dairy farmers in the eastern region. Moreover, the fruit value chain development, initially focusing on few crops such as pineapple and passion fruit, is also being processed by the Bhutan Agro-Industry plant in Lingmethang. In an effort to further develop the value chain, ensure smallholder farmers enter into contract farming relationships with the private sector, and promote commercialization. However, this public financing support to the private sector should also include some Corporate Social Responsibility conditions that will shape those relations in the future such as backward integration in terms of delivering technical support to farmers to enhance yield and quality, as well as providing shares in these plants to farmers could further boost production and the linkages.

g) There is need of some kind of built and operate principle for the facilities or inputs provided through the project to various farmers and groups for the long-term sustainability such as through proper mentoring and guidance specially for the youth groups so that even if someone drops, others will take up and continue the ventures.

h) In terms of procurement system, IFAD's requirements are different from those of RGoB, which creates problems during the process of procurement. It would be more efficient if these two systems can be synchronized for the future projects.

i) RGOB follows fiscal budget cycle from June to July while IFAD follows calendar year from January to December which is creating some problem for timely release of budgets. Thus, for efficiency and management of budgeting process, these two budgeting cycles need to be aligned and PMU must also need to understand the budget cycle to avoid some of the issues faced during budget requisition and timely release of budget.

j) Linkage of milk from the production to market have benefitted dairy farmers in terms of increasing their assured market and income. However, the problem is with regard to absence of proper cooling system to maintain a consistent cold chain to ensure milk quality and safety during transportation. Thus, there is a need of vehicle equipped with proper cooling system to transport the milk to designated processing units.

k) For those farmers and groups who are provided with equipment or machineries, they are not confident on the repair and maintenance including procurement of spare parts. Accordingly, there is a need to provide trainings on proper maintenance of equipment or machineries as well as from where to purchase spare parts for proper functioning and utilization.

l) With regards to cost sharing mechanism, there are different ratios some in 70:30 while on others 60:40. During the consultations, farmers questioned on different rules applied for different activities which is creating confusion. Accordingly, there is a need to create awareness to the stakeholders on the cost sharing mechanism and also align the system based on actual field requirements.

2. Introduction

This Project Completion Report (PCR) for Commercial Agriculture & Resilient Livelihoods Enhancement Program (CARLEP) is prepared following overall guidelines and template developed by International Fund for Agricultural Development (IFAD) for making PCR. The overall objective of this assignment was to prepare a Project Completion Report (PCR) with key elements of process evaluation framework of a developmental project including relevancy, effectiveness, efficiency, sustainability, project outcome and impact, and innovation and application adapted by the CARLEP in the project targeted areas. This report also includes elements of up-scaling of innovations and value chain establishment set up adapted by the project, institutional sustainability of the value chain group and cooperatives formed by the CARLEP project, and so on. The extent of participation of farmers in development of dairy and vegetable value chain development as well as usefulness and lessons learnt out of the outcomes and impacts of the interventions are documented. This PCR summarizes and documents these elements of the CARLEP that are implemented until middle of May, and the information and data that were available in the project.

The CARLEP is a Royal Government of Bhutan (RGoB) and the International Fund for Agricultural Development (IFAD) project, which started from 11th December 2015 for the initial period of seven years from 2016 to 2022 but was extended to 2025 due to additional funding. The total budget of the project is US$ 40,369,704 which includes US$ 20,615,025 from IFAD, US$ 11,342,259 from the Government of Bhutan, US$ 5,022,615 from the ASAP trust fund, US$ 2,982,805 Beneficiary Contributions and US$ 407,000 from the Private local sector. Out of the total IFAD funding, US$ 14.27 million was provided as loan and US$ 6.096 million as grant. Then the additional financing of US$ 10.28 million was loan and US$1.0 million as Debt Sustainability Framework grant (DSF).

From the RGoB, Ministry of Finance (MoF) is the nodal agency to review and monitor the programme with a designate focal officer of IFAD in the Department of Treasury and Accounts responsible for coordinating with PMO/MoAL and IFAD for smooth fund flow, disbursements, preparing consolidated financial progress reports, clearing Withdrawal Applications and facilitating operation of the Designated Accounts. The Ministry of Agriculture and Livestock is the Lead Programme Agency with overall responsibility of the programme to provide policy guidance and direction. The overall responsibility of project implementation is the Programme Management Office (PMO) in Mongar under the direct administrative control of Secretary, MoAL.

In total, eight missions were carried out by the IFAD part for monitoring of the work activities of CARLEP which provided substantial feedback and suggestions to accommodate on project activities (details about these missions and key recommendations are given in Annexure). The recommendations from the external missions helped the project to align the project interventions more closely with the objectives and scope of the project interventions designed in 2015, and to tailored the activities as per the changing context and requirements.

The study team reviewed all key documents and guidelines of CAREP, including all of the mission reports and the assessment reports of CARLEP prepared at its various stages of the project. Extensive consultations were carried out with all major project implementing partners and

community level key stakeholders. Wider discussions were held also with beneficiaries (producers, traders, members of farmers) in the field. The list of consultations carried out during the field visits are provided in annexure.

The study team visited the CARLEP project office different times to compiled in-depth information on performances and process of operation of the project. During that time, various stakeholders were consulted in the 6 project districts including field survey of project beneficiaries from 6th April until 12th May 2025. From these stakeholder consultations and series of FGDs carried out at the field, the study team compiled valuable information in relation to the process, performances, and outcome of the project, and stakeholders' perspectives and opinion about the project activities performed during the project period.

3. Project description

3.1 Project context

Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) is the eighth agriculture and rural development programme financed by the International Fund for Agricultural Development (IFAD). The Financing negotiation for CARLEP was held from 13-14 July 2015 followed by IFAD Executive Board approval in September 2015 and signing of Financing Agreement on 11 December 2015. In addition, the additional financing agreement was signed on 19th March 2020 and as a result, the project completion extended to December 2025.

The project was designed in line with RGoB's 11th Five Year Plan (2013-2018) with the theme of poverty alleviation and social development (reaching the unreached). The aim was to expand agriculture service outreach to the more remote and vulnerable populations and to increased resilience of smallholders to climate change and shocks, addressing key objectives of the 11FYP. The 11FYP incorporates strategies to promote economic opportunities in critical sectors such as agriculture and rural industries/enterprises within a decentralized framework.

The programme also conforms to IFAD's targeting policy of reaching the rural poor and the strategic framework of empowering the rural poor, men and women alike, to improve their incomes and food security. It was anticipated to provide support to poor subsistence farmers in remote geographies to enhance agricultural production and opportunities to market their produce through an organized marketing system, thereby improving their livelihood. The programme was well aligned to IFAD's private sector development and partnership strategy since it would entail engagement of smallholder farmers and private sector enterprises throughout the value chains for the crop and livestock commodities identified for development. It was to capitalize to build on past investments in infrastructure, capacity development and other allied production and marketing structures and also to allow for scaling-up to other areas.

The approach to programme implementation included: (i) market-led, climate-resilient agricultural diversification with intensification and expansion of vegetable and dairy value chains and marketing; (ii) strengthening and establishing farmers' production and marketing groups/cooperatives including local institutions for resilient agriculture, water-smart irrigation and marketing; (iii) facilitating agriculture and marketing institutional support and policy

development; (v) providing need-based TAs for programme planning, implementation, monitoring and policy development, including capacity building of extension and key service providers and participating agencies.

3.2 Project goals and objectives

The goal is to sustainably increase smallholder producers' incomes and reduce poverty through commercialization of production by programme households. The key impact indicators at the goal level are:

a) 5,336 household beneficiaries reporting at least 25% improvement in household asset as compared to baseline (disaggregated by HHs-head gender)
b) 15% reduction in the prevalence of child malnutrition as compared to baseline
c) More than 23,180 smallholder households supported in coping with the effects of climate change

The objective of the Project is to increase returns to smallholder farmers through climate resilient production of crops and livestock products in nationally organized value chains and marketing systems. The key impact indicators at the development objective level are:

a) Addition of 1,500 tons of vegetables, 452 tons of rice/maize and 3 million litres of milk in programme areas
b) Develop vegetable value chain and scaled-up nation-wide
c) Develop dairy value chain and scaled-up in the six eastern dzongkhags
d) Rehabilitation or restoration of ecosystem services to more than 32,000 hectares of land

The project has four programme components as summarized below:

Component 1: Market led Sustainable Agricultural Production (USD 17.34 million): The Market led Sustainable Agricultural Production would lead to sustainable increase in resilient agricultural production by rural households. The three outputs are: i) increased production resilience and diversification in agriculture, ii) intensification and expansion of vegetable production by rural households, and iii) expansion of dairy production by rural households.

Component 2: Value Chain Development and Marketing (USD 11.6 million): Component 2 focuses on instituting organized value chains and marketing systems by establishing networks of farmer groups to facilitate marketing of vegetable and dairy products to enhance smallholder incomes. FCBL to develop market-led value chains, provide physical agricultural marketing services and with the support of Dzongkhag RNR sectors, identify and put in place required value chain infrastructure. DAMC to develop marketing groups and cooperatives while Dzongkhag RNR sectors to support in production activities in value chains in the dzongkhags and provide necessary assistance to DAMC and FCBL to identify potential locales of production to set up necessary market infrastructure in villages.

Component 3: Institutional Support and Policy Development (USD 0.526 million)

Component 4: Programme Management: Important functions of programme management to include gender mainstreaming, monitoring & evaluation and knowledge management. The key

M&E functions which includes conducting baseline survey, vulnerability assessment, endline survey, annual outcome surveys, RIMS, MTR, PCR and special studies besides coordinating for IFAD's supervision and implementation support missions.

The project has four expected outcomes as shown below:

Outcome 1: Resilient agricultural production by rural households has sustainably increased. Challenges remain to make farming a source of robust and resilient rural livelihoods and to achieve national food security. The key production related outputs and activities to achieve Outcome 1 are:

a) Output 1.1 Production resilience in agriculture increased and agriculture production diversified-support promotion of integrated agricultural production and management.
b) Output 1.2 Vegetable production increased through expansion and intensification of vegetable production by smallholder households.
c) Output 1.3 Dairy production increased through expansion and intensification of dairy production in the six eastern dzongkhags to ensure adequate volumes and quality standards of milk are produced by smallholder dairy farmers to ensure the development of a sustainable dairy value chain.

Outcome 2: Increased smallholder income from crop and livestock value chains

a) Output 2.1 Resilient vegetable and dairy value chains development will be supported where FCBL will take the lead to develop value chains and marketing system in coordination with the CARLEP PMO.
b) Output 2.2: Commercial farming expanded and new farm enterprises developed by supporting groups and enterprises that work along the vegetable and dairy value chains, such as in terms of input supply, production, processing, and marketing.
c) Output 2.3: Community driven market infrastructure developed by creating value chain infrastructure at the local community level, such as village storage houses, cold stores, small trucks, market sheds, etc. to be owned and managed by communities, farmers' groups/ cooperatives or small entrepreneurs.

Outcome 3: Strengthened Agricultural Institutions and Policies for Improved and Resilient Agricultural and Marketing Practices. Climate resilient farming practices require collaboration and proactive communication between various stakeholders, including farmers, researchers and policy makers. Success of value chains, similarly, depends on collaboration and proactive information exchange between the players in the chain. Such practices require an institutional culture that fosters collaboration, legitimizes participatory approaches to engaging with farmers and values partnerships with the private sector.

a) Output 3.1 Value chain and marketing knowledge and communication strengthened by capturing and documenting knowledge and good practice from programme implementation, especially related to climate resilience, value chain and market development.
b) Output 3.2: Climate resilience and value chain development lessons mainstreamed in agricultural policies and sector strategies

3.3 Implementation modalities

The Ministry of Finance (MoF) is the nodal agency to review and monitor the programme with designated focal officer from the Department of Treasury and Accounts for coordinating with PMO/MoAL and IFAD for smooth fund flow, disbursements, preparing consolidated financial progress reports, clearing Withdrawal Applications and facilitating operation of the Designated Accounts. The Ministry of Agriculture and Livestock (MoAL) is the Lead Programme Agency with the overall responsibility for the programme implementation. MoAL to provide policy guidance, required technical staff for implementation from its pool of civil servants and technical backstopping through its line departments and field agencies.

The overall responsibility for project implementation lies with the Programme Management Office (PMO) in Mongar led by a National Programme Director. The IFAD Focal Officer in PPD, MoAL is responsible for institutional strengthening and policy development in addition to coordinating functions such as supervision missions and other policy related issues while a focal finance officer at Financial Clusters will facilitate smooth fund flow ensuring proper furnishing of withdrawal applications and follow up with MoF on other fund related issues. The overall responsibility of PMO lies in coordination of programme planning, implementation, progress monitoring, knowledge generation, funds allocation and disbursements to implementing agencies and reporting results to RGoB and IFAD, besides also sharing knowledge and learning with key programme partners.

The Geog administrations are the grassroots level implementing entities where field activities are to be planned, coordinated, implemented and supervised with full involvement of the Geog Tshogde, Gup, Geog Administrative Officer, Geog Extension Agents and Tshogpas, with close support and dzongkhag level coordination guidance from District Officers, particularly District Agriculture Officers, District Livestock Officers and District Engineers. Geogs to take lead in close coordination with dzongkhag sector staff for identification of most suitable activities and sites (village or farmers groups) for Programme investment; inputs/preparation for district level AWPBs; management of inputs supply including supervision of implementation and progress of activities, technical backstopping and training of geog staff; progress monitoring including data collection and data validation to feed into the OPM monitoring & evaluation systems; working closely with other district officers such as District Planning Officer, Finance Officer and other entities; and contribution to the knowledge management functions of the Programme through documentation of good practices and capturing lessons learned.

The District Planning Officers to assist sector staff in preparing dzongkhag level AWPBs and progress reports and will work closely with the relevant OPM unit in the operation and entry of data relating to Programme activities in the district level Planning and Monitoring System (the "PLaMs"). The District Finance Officers to manage the Dzongkhag Programme Letter of Credit Accounts and prepare the required financial reports in close collaboration with the Geog Administrative Officer and submit to the OPM.

The project is guided by a national-level Programme Steering Committee (PSC) which will meet at least half-yearly or quarterly and will provide policy directives to facilitate implementation at the field level and give guidance to the programme management. The PSC also reviews and endorses the AWPB and serves as platform for discussion and resolving issues. Secretary, MoAL

is the chair and other members are Director, Agriculture; Director, Livestock; Director, Department of Agriculture Marketing and Cooperatives; Director, or nominee from Finance; Chief Planning Officer, MoAL and representatives from collaborating development partners and civil society organizations. The National Programme Director of the Programme is the Member-Secretary of the PSC.

At the regional level there is Programme Implementation Committee (PIC) which steers synchronization of AWPB and implementation at Gewog, dzongkhag and regional level to enable combining of some dzongkhag level activities and sharing experiences for possible replication in other areas. The members composed of the Dzongdas of the Programme dzongkhags, two nominated Gups representing Geog level implementation, representatives from the Regional Agriculture Marketing and Cooperatives (RAMCO), Regional Directors of various MoAL agencies and representatives from collaborating development agencies.

3.4 Target groups

CARLEP is implemented in the six eastern dzongkhags of Lhuentse, Mongar, Pemagatshel, Samdrup Jongkhar, Trashigang and Trashiyangtse to build sustainable agricultural production and strengthen vegetable and dairy value chains. The programme was also to support rice production through enhanced water use efficiency and climate-resilient irrigation systems in the four high potential dzongkhags of Mongar, Pemagatshel, Samdrup Jongkhar and Trashigang and production of maize in all eastern dzongkhags. The adoption of an integrated farming system has the potential to produce additional commodities such as, fruits, wheat/cereals, buckwheat, barley, millets, pulses, oilseeds, tuber crops and fodder, for which the project aimed to support for increased smallholder diversity and resilience. Backyard poultry (chickens and ducks) and piggery production was also supported as part of an integrated farming system, based on local conditions, demand and resource availability.

CARLEP targeted to work with 21,860 HH with about 144,875 beneficiaries including indirect beneficiaries access to climate resilient farming practices in six dzongkhags to build sustainable agriculture production. For each of the dzongkhags, CARLEP worked in selected identified Gewogs based on the demonstrated production potential in selected commodities, relative accessibility to road and marketing channels, and demonstrated interest and commitment of communities and farmer organisations. The project follows an inclusive approach to include all households living in a particular community but the priority was on the most vulnerable poor and smallholders for the allocation of programme activities and benefits. Active involvement of women as well as youth and dealing with specific opportunities and challenges concerning them was the priority of the project.

It was anticipated that nearly 2/3rd of households in eastern dzongkhags which were not benefited from value chain activities would benefit from support for climate resilient farming through extension support as indirect beneficiaries. Direct beneficiaries from irrigation scheme renovation were assumed to be covered under the vegetable groups. Indirect beneficiaries from improved access to markets because of CARLEP support to value chain development were also included.

Table 1: Number of direct and indirect beneficiaries

Description	No. of groups	Groups with overlapping memberships	Non-overlapping households	Non-overlapping beneficiaries	Non-overlapping households in eastern Dzongkhags
Direct beneficiaries (Value Chain)					
New vegetable groups	300		4,500	22,500	3,000
New dairy groups	150	120	450	2,250	450
Existing vegetable groups	120		1,800	9,000	1,800
Existing dairy groups	43	30	195	975	195
Other agricultural enterprises	200	30	170	850	170
Indirect beneficiaries (others)					
Climate resilient farming			21,860	109,300	14,700
Total			**28,975**	**144,875**	**20,315**

(Source: Programme design report)

4. Project relevance

4.1 Development challenge and project theory of change

CARLEP aims to transform subsistence agriculture into a sustainable, market-driven sector by promoting climate-smart practices, strengthening value chains, and enhancing community capacities. Its theory of change focuses on improving livelihoods through increased productivity, profitability, and sustainability of agriculture by building climate resilience and developing market-oriented value chains. This is achieved by supporting climate-resilient farming practices, improving infrastructure, and strengthening value chains.

Bhutan's economy has not yet evolved to a level where secondary and tertiary sectors were in a position to provide significant jobs. The economic growth of the country is driven by the industrial sector, particularly the hydropower sector but has limited potential for creating productive jobs to absorb a growing and an increasing number of educated labour force. In rural areas, only 62.9% of the poor are literate, those most in need of jobs do not have the education required to benefit from economic growth through development of industry and tourism. Lack of access to technology, business development services, fair markets and suitable financial products remain constraints affecting rural enterprise initiation and development. Loans outstanding from institutional sources in the farm sector constituted a minuscule 2.23% of all institutional loans in 2012. For a largely subsistence economy a transition into enterprises without a supportive economic system is always difficult. For Bhutan to integrate rural populations within its nascent market economy through agriculture commercialisation and Small and Medium Enterprises (SME), a comprehensive development policy, more public investment and private sector engagement are necessary.

In the rural context of Bhutan, youths are mostly school dropouts and are engaged in casual unskilled wage labour, while in general, many youths are reluctant to take up agriculture or forest-

based work. Situational analysis and youth assessments carried out in 2012 have confirmed the need for addressing youth specific interventions.

Development of the RNR sector, which comprises agriculture, livestock and forestry, has been relatively slow in Bhutan. Key reasons are low levels of technology adoption, predominance of subsistence farming, large tracts of fallows and lack of market access. Slow growth of agriculture has led to heavy reliance on imports of farm products from India which has added to the economic crisis since 2011-12. RGoB has accorded highest priority to agriculture development in the 11FYP and agriculture is featured as one of the five jewels20. This comes out of the realisation of the importance of the farm sector to the economy, and its significance in meeting food and nutrition security, poverty reduction, and equitable and sustainable economic development goals.

Thus, based on the lessons learnt from previous various successful value chain programmes shown that an integrated value chain approach needs to facilitate and address multi-stakeholder interests and requires adequate but diverse capabilities. In areas under AMEPP and MAGIP where a value chain approach was developed and promoted, most notably the Vegetable Value Chain Programme in the East (VVCP-E), success has been visible in strengthening relationships between key value chain actors and linking farmers to markets, as well as in increasing production. Accordingly, CARLEP has taken the opportunity to build on the success and lessons from these interventions, through integrating adequate value chain research and multi-stakeholder process facilitation.

4.2 Alignment

CARLEP was designed in line with RGoB's 11th Five Year Plan where poverty alleviation (targeted poverty intervention) and social development (reaching the unreached) are the overarching themes. CARLEP was to contribute towards expansion of agriculture service outreach to the remote and vulnerable populations and to increased resilience of smallholders to climate change and shocks as per the key objectives of the 11FYP. Earlier, MoAF has developed a strategy of market-led agriculture development to facilitate the transition from subsistence to commercial agriculture. In order to ensure an enabling environment and promote private sector participation and contract farming as part of its strategy, MOAF has directed FCBL to take the lead.

CARLEP programme also conforms to IFAD's target policy of reaching the rural poor and the strategic framework of empowering the rural poor, men and women alike, to improve their incomes and food security. The programme aimed to provide support to poor subsistence farmers in remote geographies to enhance agricultural production and opportunities to market their produce through an organized marketing system, thereby improving their livelihood. Thus, CARLEP was also well aligned to IFAD's private sector development and partnership strategy by engaging the smallholder farmers and private sector enterprises throughout the value chains for the crop and livestock commodities.

The programme is also in line with ASAP objectives and guidelines by addressing key elements of climate change which are clearly addressed in the country analysis and the programme has integrated climate change in the programme goal/outcomes and areas of intervention as a starting point for a comprehensive and holistic view on climate change consequences for smallholder target groups and on how climate change can affect and inform all proposed programme interventions. The programme interventions such as increasing resilience through technology and (local)

institutional strengthening provide a medium to longer-term outlook while addressing development challenges smallholders currently face such as climate variability (unpredictability), water scarcity, soil erosion and depletion, as well as lack of access to livelihoods diversification opportunities, including income from marketing produce.

Accordingly, the objective of CARLEP is relevant and is in line with the main government policies and strategies including those of the 12th Five Year Plan (FYP) and the present 13th FYP of the Royal Government of Bhutan. The activities implemented under CARLEP have strong relevance to the national goal of transforming the agricultural sector from subsistence-based agriculture into a sustainable value chain market-driven productive sector. CARLEP has successfully introduced several initiatives that have transformed the lives of smallholder farmers in eastern Bhutan, including mushroom production, fruit intensification, fallow land conversion, dryland irrigation and dairy value chain development. CARLEP has been instrumental in terms of the lessons it generated to effectively implement rural development interventions in Bhutan. It has also informed other development projects in the country, including the newly initiated IFAD BRECSA project, which is to scale-up CARLEP successful experiences to further promote commercialization. The program's relevance is further underscored by its alignment with national priorities for climate-resilient agriculture, value chain development, and agricultural commercialization. In essence, CARLEP's relevance to Bhutan includes the following:

Aligning with National Development Goals: CARLEP directly supports Bhutan's 13th Five-Year Plan by focusing on climate-resilient agriculture and promoting market-oriented value chains. It contributes to the Royal Government's broader vision for agricultural development and rural livelihoods.

Promoting Climate-Smart Agriculture: CARLEP's core objective is to enhance the resilience of Bhutanese agriculture to climate change impacts. This includes promoting climate-smart production practices, water-efficient irrigation, and diversification of crops such as development of resilient irrigation systems and facilitates the use of climate-smart inputs.

Strengthening Value Chains: CARLEP aims to develop and scale up market-oriented value chains for key agricultural commodities, such as vegetables and dairy. This involves improving access to markets, enhancing post-harvest management, and promoting farmer-led enterprises. The program also supports the development of farmer cooperatives and strengthens their capacity to engage in commercial agriculture.

Enhancing Rural Livelihoods: By increasing productivity, profitability, and sustainability of agriculture, CARLEP contributes to improved livelihoods for smallholder farmers. The program targets vulnerable households, including women and youth, and promotes inclusive growth. For instance, CARLEP has supported initiatives like mushroom cultivation, hydroponics fodder production, and artificial insemination for dairy cattle.

Building Capacity and Institutions: CARLEP invests in strengthening the capacity of local institutions, including farmer groups, cooperatives, and extension services. This includes training farmers in climate-smart agriculture, value chain development, and business management. The program also supports the development of human resources, such as Community Animal Health Workers (CAHWs) and Community Animal Insemination Technicians (CAITs).

Fostering Innovation: CARLEP explores and promotes innovative approaches in agriculture, including permaculture, biogas production, and e-agriculture. The program also supports the testing of new technologies and practices to enhance agricultural productivity and sustainability.

CARLEP plays a vital role in supporting Bhutan's transition towards a more sustainable, resilient, and commercially viable agricultural sector, while also contributing to improved rural livelihoods and food security.

4.3 Adequacy of design changes

The CARLEP has seen several changes, including an extension, budget reallocations, and a focus on climate-resilient agricultural practices. The project, initially launched in 2016, was extended until 2025 with additional financing from IFAD to enhance returns for smallholder farmers. A key change involves re-allocating the budget, particularly addressing overspending in certain categories and potentially depleting funds in others. The project also emphasizes transitioning from subsistence-based agriculture to a market-driven, sustainable sector, with a focus on climate-resilient production and value chains.

To optimize resource utilization and ensure continued IFAD support to Bhutan, a partial cancellation of USD 2.041 million as unused loan funds was made with potential recommitment to future IFAD interventions in the country.

Changes to the project logical framework has been made in order to improve consistency and relevance with the project design. Three forms of changes have been proposed:

a) Removal of project indicators that are repetitive to the IFAD core indicators or are not relevant;
b) Target revision on group numbers and membership to remain consistent with the original design targets (450 groups, 4950 members), and to remain realistic in the context of Bhutan; and
c) Shifting of some indicators to the more relevant output, for example, shifting “2.1.6 Market, processing or storage facilities constructed or rehabilitated” to the correct output “Community-driven Strategic Market Infrastructure developed."

The original allocation of USD 151, 000 under Goods, Services and Inputs under IFAD additional loan for CARLEP (approx. 1.47% of the total additional loan financing) has been overlooked apart from erroneous charging of expenses under GSI rather than works category. Hence, the need for funds under GSI has become crucial due to COVID-19 pandemic and support for post-COVID recovery. The stopping of agricultural produce imports due to COVID-19 restrictions has called for increasing expense under GSI in order to boost domestic vegetable and livestock production. Similarly, the Russia-Ukraine conflict has led to hike in fuel prices and thereby increased cost for most goods and services. Therefore, all these situations have demanded for cost reallocation from Works to GSI and Equipment and materials.

Two new outputs under additional financing: Output 1.5 for herbal, medicinal and aromatic plants (HMAP) collection and cultivation and Output 1.6 for aquaculture production (trout hatchery) was dropped due to limited interested beneficiaries for the uptake of these activities.

During the Mid Term Review and design mission, resource allocation of IFAD USD20.560 million has been finalized to focus on the priorities of the 12th FYP in line with the policy guidelines of the IFAD Governing Council. During which major institutional reform was also undertaken whereby FCBL, a key actor in value chain development and marketing was disengaged from CARLEP because of the incapacitation of the FCBL to carry forward both diary and vegetable value chain as mandated in the program design. Instead, Kofuku International Limited, Chenery, as the definite market for fresh milk produced by farmer groups, was taken on board as one of the active contributors to dairy value chain development. Similarly, RAMCO has been designated to facilitate vegetable marketing contributing to vegetable value chain development.

5. Project Development Effectiveness

5.1 Effectiveness

CARLEP has demonstrated effectiveness in transforming eastern Bhutan's agricultural landscape by reaching 33,003 households (HHs) surpassing the target by 114% with strong gender inclusivity reflected in 52% female-headed household participation. The project's impact is evident in its successful transition of subsistence farming into profitable, market-oriented enterprises. The project's effectiveness is particularly visible in its integrated approach to value chain development. In the dairy sector, farmer groups have evolved into successful enterprises, with processing units like the Koufuku International Limited (KIL) and several community-based processing groups providing assured markets for smallholder dairy farmers. Similarly, vegetable producers have established reliable market linkages with schools and institutions. This commercialization has led to tangible increased in household incomes and improved food security. The establishment of climate-smart villages and preservation of indigenous stress-tolerant crop varieties have enhanced community resilience while maintaining agricultural biodiversity. Additionally, CARLEP's strategic investments in infrastructure, combined with comprehensive capacity building of farmers' groups, have created sustainable pathways for agricultural growth. The project has been very successful in building scalable models and approaches for agricultural development. Evidence of this effectiveness can be seen in the widespread adoption of improved practices, the emergence of successful agri-enterprises, and the strengthening of local value chains as highlighted in the case studies given in the annexure.

The project continues to strengthen vegetable and dairy value chains through comprehensive support to rural producer organizations, agriculture enterprises, market infrastructure, and market linkages. As of 2024, 329 small-scale agriculture enterprises and 253 vegetable and dairy farmers groups have received support. While the target for new dairy and vegetable group formation may not be met (currently at 56%), CARLEP has effectively reached a larger number of beneficiaries through fewer groups. This is partly because only formal groups registered with DAMC have been counted under this indicator, despite support also being provided to informal groups. Additionally, the project's strategic emphasis on creating fewer but larger groups has reduced the focus on new group formation. The project is well on track towards achieving its objectives and outputs, with 66% of indicators already achieved or surpassed and another 24% on track. Average annual household income in 2024 reached Nu. 179,849, representing a 71% increase compared to 2018.

Additionally, nearly 85% of households report adopting improved inputs, technologies, or practices (98% for crop technologies and 72% for livestock technologies). The success of CARLEP-supported rural enterprises, such as mushroom farms and dairy processing groups, which report increased profits, indicates a positive outlook for achieving project outcomes.

Further, the overall goal of the project was to sustainably increase smallholder incomes and reduce poverty by transforming the rural economy has been met effectively. This is goal has been already achieved as selling of all types of livestock and agriculture products on daily basis ae visible along the highway or around the town areas in the eastern region. Further, there are market sheds, milk processing units or collection centres with the CARLEP signboards. Now the farmers are earning in millions in a year instead of few thousands as reported in the baseline study. Earlier, vegetable markets were just there for earning morning hours around the Mongar town but now is it being operated throughout the day. All these were possible due to effective management of the project.

Farmers were made self-sustaining through provision of extensive trainings such as lead farmer training, post-harvest management, and skills for specific crops like vegetables and dairy. Even for the irrigation system, farmers were fully engaged during the project implementation process so that they are fully aware of what needs to be done during operation and maintenance. Another example is Artificial Insemination where the lead farmers are taking responsibility to provide services in the communities without having to depend on veterinary officers. In addition to that for all input supplies, cost sharing mechanism has been adopted so that the beneficiaries are equally accountable for all project interventions which allowed them to take care of their equipment and facilities.

5.2 Impact

CARLEP has demonstrated positive overall performance, particularly in boosting vegetable production and farmer incomes. The project has shown success in extending its reach to beneficiary households, with a high percentage of targeted households participating and reporting positive impacts. CARLEP has been actively working to enhance climate-resilient agriculture and improve marketing systems for agricultural products. As of December 2024, CARLEP has reached 33,003 households (HHs) against the end target of 28,975HHs which is 114% of the outreach target, of which 52% are women-headed. A total of 10,602 HHs were able to adopt new or improved technologies which is 176.7% from the target of 6,000HHs. The production of vegetable saw a significant increase from 11,343MT in 2016 to 14763MT in 2020 with nearly 30% rise. Farmers' income grew by 217% between 2016 and 2020, largely due to increase in sales of vegetables with the establishment of market linkages to schools and institutions.

The increased in the expansion of the dairy value chain is visible in the number of infrastructures supported by the project. As per the record of 2023-2024, among the 104 market, processing and storage facilities (94% of target) constructed/rehabilitated by the project, at least 77 are milk collection facilities equipped with freezers and chillers that have enabled more than 3,270 households to sell their milk with minimum spoilage. Similarly, the vegetable value chain has also received significant infrastructure support, with 8,317 HH (83% of target) supported with water availability or efficiency, and at least 1,543 hectares under water-related infrastructure (80% of target).

Production and yield of major agriculture products

	2024			2015		
Crops	Harvested (acre)	Production (MT)	Yield (Kgs/acre)	Harvested (acre)	Production (MT)	Yield (Kgs/acre)
Paddy	3,909	6,571	1,681	10,504	15,026	1,431
Maize	9,751	17,579	1,803	29,082	45,566	1,567
Potato	2,758	11,112	4,029	5,589	16,067	2,875
Cardamom	969	184	190	172	9	55
Chilli	954	1,613	1,691	1,865	2,580	1,383
Cabbage	277	806	2,910	1,058	1721	1,627
Cauliflower	172	279	1,622	545	755	1,385
Radish	335	703	2,099	1,307	2,201	1,684
Beans	372	510	1,371	1,156	1,155	999
Carrot	48	70	1,458	173	205	1,185
Peas	101	120	1,188	363	464	1,278
Tomato	37	45	1,216	144	163	1,132
Onion	67	68	1,015	368	400	1087
Broccoli	212	327	1,542	229	284	1,240
Ginger	1109	2600	2,344	1042	2,063	1,980

(Source: Endline survey)

CARLEP has strengthened food security and nutrition through targeted interventions. For instance, in 2023-2024, project supported 101 pro-poor households (44 female-headed) with backyard poultry farms. The project also installed 36 dome-shaped biogas digesters across Lhuentse, Mongar, Samdrup Jongkhar, and Trashigang which reduced dependence on commercial gas and firewood while producing bio-slurry for vegetable farming.

CARLEP continues to promote innovative technologies and sustainable farming practices across eastern Bhutan. The project introduced greenhouse solar dryers that have proven particularly effective for drying fruits, vegetables, cardamom, and meat during monsoon seasons. For example, the project has supported 31 greenhouse solar dryer sets with exhaust fans under 80:20 cost-sharing arrangement including ten greenhouses to vegetable growers in Mongar and Lhuentse Dzongkhags during the FY 2023-24. Similarly, over 120 households engaged in vegetable commercialization received drip and sprinkler systems in Trashigang and Lhuentse Dzongkhags through 70:30 cost-sharing model. Details of various inputs supported by CARLEP are shown in the table below. Cost sharing mechanism is one of the strategies adopted during the 12th FYP which are concentrated to specified subsector interventions complementing regular development plans and programs of the RNR sector. One of the goals of cost sharing mechanism is to share the costs involved and sharing of the responsibilities to ensure the success of the activity being implemented.

For instance, with better storage facilities and market infrastructure for Dungsam Vegetable Market in Nganglam, farmers now find it easier and more affordable to take their produce to market. This has led to reduced spoilage of perishable goods such as vegetables and dairy products, faster and safer transportation, and improved access to reliable markets. As a result, farmers are able to sell their produce at better prices by directly reaching buyers, including wholesalers and

institutions. These improvements have boosted their income, motivated them to increase production, and contributed to the overall development of the local economy.

Jamyang, an exemplar of a progressive lead farmer in Bartsham, Tashigang shows an example of transformative impact of lead farmer training. Having benefited from these programs, he is now playing a crucial role as an aggregator and is extending post-training outreach services to 36 fellow farmers in his community. It is noteworthy that the project has successfully trained a substantial cohort, numbering 18,350 individuals to date, with nearly half of them being female beneficiaries. For the vegetable and dairy groups, it is evident that the formation of these groups has not only bolstered women's income but has also fortified their social cohesion and networks. For instance, the women's vegetable group in Drametse coordinates their vegetable supplies to the local school through a WeChat group, aligning their deliveries with the school's demand on a fortnightly basis. Beyond the economic aspect, it also provides opportunities for social networking and leisure, underscoring the broader impact of the project on the social fabric of the community.

Annual household income from sale of products and services

Source of income (Nu.)	Lhuentse	Mongar	P/gatshel	S/Jongkhar	T/gang	T/yangtse	Total
Cereals	30,000	1,751,250	405,000	-	558,000	235,000	**2,979,250**
Sale of vegetables	1,669,105	11,160,780	1,720,100	2,515,800	3,060,900	2,520,000	**22,646,685**
Poultry-eggs sold	130,700	512,010	641,400	2,205,600	-	54,900	**3,544,610**
Fruit	47,000	3,937,250	595,500	44,200	1,051,300	269,000	**5,944,250**
Livestock (Meat sold)	-	-	12,600	620,000	-	-	**632,600**
Cash crop	1,006,650	4,562,670	3,749,270	6,741,715	1,405,800	1,130,750	**18,596,855**
Farm labour/off farm activities	1,252,500	4,082,000	2,275,400	1,764,400	20,000	130,000	**9,524,300**
Processed products sold	-	1,722,000	-	60,000	-	70,000	**1,852,000**
Enterprise	135,000	-	1,740,000	1,428,000	74,000	910,000	**4,287,000**
Livestock (dairy products sold)	1,733,540	9,816,424	10,049,120	5,555,890	3,691,000	824,750	**31,670,724**
Total	**9,031,495**	**39,563,384**	**30,362,490**	**28,383,605**	**10,416,000**	**7,104,400**	

(Source: Endline survey)

The impact in terms of sale of vegetables and livestock products from the 6 Dzongkhags are making an annual income of Nu. 22.65 million and Nu.31.67 million followed by cash crop with the annual earning of Nu. 18.59 million. This has been possible with the various project interventions made in improving the value chain of vegetables and livestock.

Specifically, project undertook some of the following interventions effectively:

a) Crop diversification

Climate Smart Villages (CSV) had been identified in the six eastern Dzongkhags with an aim to increase sustainable agricultural production by adapting climate-smart technologies and building resilience to climate change. Introduction of heat-tolerant varieties of crops for cultivation by the farmers in the climate smart villages is one of the activities undertaken. Heat-tolerant vegetables such as cauliflower, radish and asparagus were promoted. Since the productivity of a crop depends on the soil fertility, pests and diseases management which are enhanced by organic approaches in

contrast to conventional synthetic methods. Accordingly, CSVs were showcased with organic soil improvement methods, such liquid manure, bokashi, BAMS and jeevamrut etc.

b) Apiculture

CARLEP also promoted apiculture (Apis Cerena) in areas where indigenous crops are popularly grown. Apiculture not only helps enhance income of the farmers, but it also helps in pollination of agricultural crops besides ensuring conservation of local bees. For example, a total of 14 households at Pemagatsehl were supported with apiculture inputs for honey production and to increase on-farm diversity.

c) Solar dryer promotion

A greenhouse solar dryer represents an innovative and sustainable approach to drying fruits and vegetables, particularly valuable during the monsoon season. By harnessing solar energy, it creates a controlled drying environment, which offers numerous advantages such as increased efficiency, higher quality dried products, and reduced spoilage. This technology is especially beneficial for farmers and producers aiming to improve their post-harvest processes and add value to their produce. Project supported with 31 solar dryers to various households.

d) Poultry farm resilience

Support for small-scale poultry farming was provided to pro-poor and vulnerable households to enhance farm resilience, household nutrition, and income. For instance, in 2023-24, inputs were provided to establish 101 backyard poultry farms aimed at generating income, improving family nutrition, and enhancing farm resilience.

e) Establishment of community-based seed production groups

The National Maize Program, in partnership with the Geog Agriculture Sector in Udzorong, initiated community-based hybrid maize seed production of Wengkhar Hybrid Maize-1 (WHM-1). It was aimed to enhance the maize hybridization program and improve domestic seed systems, thereby increasing maize production.

f) Outreach of extension services

In order to enhance outreach services, number of events were organized such as Food and Art Fair in Mongar from 15th to 17th October, 2023 with the objective to promote quality, standard and market linkage for local produce. Similarly, RNR Exhibition was held on February 21, 2024, within the newly constructed Farmer Sales Outlet in Samdrupcholing Drungkhag, Samdrup Jongkhar where Samjong Cooperatives showcased various value-added products to the public. Further, Yangnyer in Trashigang, Druk Chethuen Tshokpa Dairy group members and the community of Gongthung Village came together to celebrate and promote the theme of "Dairy Renaissance: Building Tomorrow's Future" in a highly successful cattle rally program. The aim was to highlight the importance of the dairy industry in rural development and to showcase the advancements and opportunities in cattle farming.

g) Efficient Irrigation system

Automated drip irrigation systems provide many benefits for fruit orchards by significantly improving efficiency, productivity, and sustainability. These systems deliver water directly to the root zones of plants, ensuring precise water application that reduces wastage from evaporation, runoff, or wind. This targeted irrigation conserves water and maintains consistent soil moisture

levels, which is vital for the healthy growth of fruit trees and higher yields. Moreover, because the foliage stays dry, the risk of fungal diseases and other pathogens is minimized. Automated systems also reduce the need for manual watering, saving labor and allowing workers to concentrate on other essential tasks. Although the initial setup cost is high, long-term savings on water bills, labor, and increased crop yields make automated drip irrigation a cost-effective investment. These systems can be tailored to fit orchards of any size and can be integrated with smart technologies for real-time monitoring and adjustments. Remote monitoring and control add convenience, ensuring optimal irrigation management even when the orchard owner is not on-site. About 1074 efficient irrigation sets were provided to various households.

h) Rain water harvesting Technology

Roof-top rain water harvesting technology was promoted in areas where there is acute shortage of water during winter months. Under this scheme, the farmers were supported with rain water storage tank construction by supplying cement, rain gutter, reducer, pipes and skilled man power while the beneficiaries contributed locally available materials like sand, gravels and labor. Farmers have reported significant improvement in maintaining homestead nutrition gardens for household consumption, as well as an improvement in household sanitation after the intervention.

i) Supply of climate resilient vegetable seeds

Production input support for commercial vegetable growers as well as small-holder farmers are being supported to promote vegetable commercialization for meeting the demand for schools and Institutions feeding program. The program primarily targeted vegetable groups and individuals who ventured into commercial production of assorted vegetables such as chili, onions, tomatoes, cauliflower, cabbage, broccoli and ginger, and those linked with school and hospital feeding programs as well as market within the locality and other Dzongkhags.

j) Supply of green houses

Greenhouses were promoted with the objectives to obtain optimal production of vegetables by enhancing yields, quality improvement and extending the effective harvest period. Seasonality and weather conditions is known to largely influence vegetable farming. Thus, in order to produce vegetables with limited environmental influence, protected agriculture have gained popularity in the programme areas and were successful. About 1182 green houses were supported by the project.

k) Improved dairy shed construction

CARLEP continues to support dairy farmers in constructing hygienic cow sheds to promote stall feeding and reduce overgrazing in forests. This initiative facilitated clean milk production and proper management of cow dung for biogas production where the project provided dairy shed construction materials while the beneficiary contributed major share of the cost. Project provided support for construction of 2137 dairy sheds.

l) Supply of improved cattle breed and breeding bulls

Increasing milk supply base is made possible through subsidised support to purchase of quality dairy cows and improving the genetics through breed upgradation. Dairy cows and Heifer importations was initiated pre-COVID-19 pandemic as a fast-track mechanism to increase the smallholder dairy herds thereby enhancing milk production. Post COVID-19, internal sourcing of dairy animals was carried out by the Dzongkhags whereby CARLEP supported 30 % of the cost, while the beneficiaries contribute for 70 %. Further, under dairy breed enhancement program,

breeding bulls were supplied in areas inaccessible to Artificial Insemination (AI) for breed upgradation and improvement, thereby enhancing productivity. Project supported by providing 2311 improved cattle and 52 breeding bulls.

m) Pasture development and fodder

Pasture development in fallow and marginal land was facilitated through the supply of improved pasture seeds. Napier and Gautemala grass have become one of the major sources of forage for cattle in the eastern region and recently, Pakchong variety has been introduced for propagation in the farmers field as it has higher nutritive value besides higher biomass. Oat cultivation during winter, after agriculture crop harvest, has helped marginal farmers to utilize agriculture land effectively for winter fodder production. Fodder cultivation supported to 3690 acres and winter fodder promotion to 5249 acres.

n) Land development, terracing and consolidation

The terrain of the land in 6 eastern Dzongkhags is characterized by steep slopes and surface stones making farm mechanization very difficult. Even the wet land terraces are too narrow and difficult for deploying farm machinery. In line with 12th FYP, CARLEP has prioritized land development as one major intervention for cereal intensification and vegetable commercialization. Agriculture Land Development (ALD) has been implemented based on three categories such as dryland terracing, Wetland consolidation and fallow land reversion. Project provided support for 1,533 acres of land development as well as wet land and fallow land conversion etc.

o) Community-driven strategic market infrastructure development

Large market facility construction was supported by the project with the aim of formalizing agricultural value chains whereby different actors (Producers, traders, wholesalers, retailers and buyers) have access to market facilities. The construction was supported based on the need and feasibility studies of the infrastructures. Since product aggregation plays a crucial role in channelizing fresh milk from farms to dairy processing units, program supported construction of milk collection sheds and milk collection centers to motivate farmers in collective marketing of dairy products besides improving hygiene. Project supported for construction of 25 milk collection centres, 65 milk collection sheds including market sheds or counters.

p) Commercial enterprise development

Mushroom is a high value crop which has a great scope for enterprise. In order to generate income through mushroom enterprise, selected youths were supported from six eastern Dzongkhags along with enterprise skilling and post skilling. Further in collaboration with the Bhutan Agro Industries Limited (BAIL), contract farming was supported to farmers to produce organic fruits with technical guidance from ARDC Wengkhar and Gewog agriculture sectors.

q) Training and capacity development

Even in terms of trainings conducted by the project, they found it very useful as they provided them practical knowledge on improving farming techniques, enhancing crop yield, and efficient use of water. The irrigation training helped them to learn about water-saving techniques, such as drip irrigation, which is especially valuable in areas with unpredictable rainfall. The farmer skill training also taught them to know about how to improve dairy farming practices and better management of livestock.

The trainings have enhanced their individual and organizational capabilities, foster innovation and engagement, enabled them for effective decision-making and promote continuous learning. They contributed to the long-term success and sustainability of organizations in a dynamic and competitive business environment.

Trainings have significantly improved farm productivity, promoted climate-smart agriculture, and enhanced farmers' business skills. CARLEP has used targeted trainings to help smallholder farmers shift from subsistence farming to a more profitable, market-driven agricultural economy. The impact of the trainings is visible in terms of the following:

i. Agricultural production and practices

Farmers who received training saw a significant increase in vegetable production in Mongar, Trashigang and Trashiyangtse districts. It also empowered them to implement efficient water management systems, including drip irrigation. Trainings have also to practice enhanced dairy farming through practices like hygienic cow shed construction and fodder conservation.

ii. Business and marketing skills

Improved farm shop operations by strengthening marketing links between farmers and the market which helped them to organize the agricultural value chain more efficiently. Farmer’s group were able to manage properly along with proper record keeping and financial transparency. It also led to improvement in post-harvest management aspects such as cleaning, grading, and packaging for improvement of product quality and to ensure compliance with market standards.

iii. Youth and enterprise development

The trainings have helped the young people to overcome barriers and pursue independent livelihoods rather than remaining unpaid family workers. It also led to development of off-farm enterprises particularly in agri-processing and vermi-composting.

Some of the trainings undertaken are as follows:

Table 2: Details of various trainings undertaken

Training type	Year	Duration	Participants
Training of Trainers on installation of SMART irrigation and automation system	2022-23	8 days	12 participants
Training on Nursery Management and Plant Propagation of fruit trees	2022-23	3 days	12 participants
Permaculture Training	2022-23	10 days	12 participants
Hands on training on liquid manure preparation	2023-24		25 beneficiaries
International training on hybrid maize seed production	2023-24	3 days	30 participants
Training on orchard Management and citrus canopy management	2023-24	2 days	41 farmers
Hands-on Training on T-bar trellising for Kiwifruit	2023-24	4 days	19 farmers
Training of Trainers on the establishment of commercial strawberry production with automated drip irrigation	2023-24		

Hands-on Training on Installation and Management of Automated Drip Irrigation System	2023-24	4 days	16 participants
Hands on Training on Mushroom Cultivation	2023-24	2 days	40 participants
Refresher training of CAIT	2023-24	2 weeks	11 CAITs
Training of dairy farmers	2023-24		371 farmers
Animal health refresher training for Livestock Extension Staff	2023-24		33 livestock field staff
Training on Dairy Management and Clean Milk Production	2021-22		489 farmers
Training on vegetable postharvest management and related technologies	2020-21		564 farmers

r) Support Formation of Multi-Purpose Cooperatives/Upgrading of Existing Farmer Groups

The farmer groups and cooperatives development are one of the important programs of the Regional Agricultural Marketing and Cooperatives Office. The FGs and Coops are entities which can address the problem of low scale production and build social cohesion in the community. In the east, where commercialization is challenging, the formation and development of farmer's groups and cooperatives is the only approach to achieve the economies of scale for marketing.

The up-gradation of progressive FGs into cooperatives indicates the transition of farming from earlier subsistence to a semi-commercial or commercial farming. In this fiscal year, four dairy cooperatives were upgraded into cooperatives. The up-gradation was carried out after identifying potential FGs, reviewing of by- laws, business plan and management plan. Beside up-gradation of farmer groups, one multi-cooperative and 12 progressive farmer groups have been registered.

Table 3: Farmer's group formation and upgradation

Dzongkhag	No. of FGs	Member			Remarks
		Male	Female	Total	
Mongar	9	27	123	150	New registration
Pemagatshel	3	130	56	186	New registration
Trashigang	4	58	41	99	Up-gradation
Samdrupjongkhar	6	149	153	302	Up-gradation
Pemagatshel	1	34	35	69	Multi-purpose
Total	**17**	**287**	**338**	**625**	

Table 4: Details of various inputs supported by CARLEP

	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Total
Solar dryer supplied (nos)				5			3	13	10	**31**
Backyard poultry farming (nos)		130		110	140	175	145	35	110	**836**
Biogas digester installed (nos)		3		266	160	196	190	31	36	**882**
Vegetable commercialization support (acres)		346	213	376	1844	612	1086	137	591	**5,205**
Green house (nos)		32	64	94	239	250	241	60	202	**1,182**
Hygienic dairy sheds	20	373	265	186	568	394	147	50	134	**2,137**
Chaff cutter		127	74	141	391	941	622	160	134	**2,590**
Land development (acres)		172		19	342	305	502	68	125	**1,533**
Electric & chain link fencing (km)		12.5	54	44.4	276	397	200	53.6	3.44	**1,041**
Dryland irrigation scheme (km)		9.5	6.8	37.5	27.7	52.7	19.4	4.8	17.2	**175.6**
Canal irrigation constructed/renovated (km)		26.1	10	61.5	8.2	8	7.2	12.5	1	**134.5**
Efficient irrigation promoted (sets)			120	399	56	105	101	43	250	**1074**
Winter fodder promotion (acres)		444	166	316	1338	992	655	718	629	**5249**
Fodder slips propagated (acres)		72		50	31	182	180	153	74	**750**
Pasture developed (acres)	187	418	73	560	727	997	358	80	290	**3,690**
Breeding bull					14	2	20		16	**52**
Sex sorted semen					3850	3890		4000		**11,740**
Dairy cow		246	265	257	409	415	253	278	188	**2,311**

	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	Total
Construction of milk collection center (nos)		1	1	1	2	6	3	8	3	**25**
Construction of milk collection shed (nos)			20	6	6	7	9	8	9	**65**
Promotion of rain water harvesting (HHs)					14	48	10	53	44	**169**
Vegetable commercialization support (acres)		345.56	212.95	375.9	1843.8	612.4	1086	136.61	591.14	**5204.36**
Efficient irrigation system (households)		399	56	105	101	43	250	94	128	**1,176**
Hygienic dairy shed construction (nos)	20	373	265	186	568	394	147	50	134	**2,137**

5.3 Gender equality and empowerment

The project explores and facilitates the promotion of need-based gender-friendly farm machinery, technologies, equipment & tools such as chaff cutter, corn sheller, quinoa de-husking, protected agriculture, electric dryers, electric fryers, weighing and sealing machine, Flexi-biogas, mini-power tillers, and also facilitate the promotion of efficient water use technologies such as drip irrigation, sprinkler, and automated irrigation to ease the burden of women farmers and enhance production.

CARLEP also supports the formation of women's groups to ensure active participation of women in project related activities, decision-making bodies and committees. Likewise, the programme promotes a proportionate representation of women beneficiaries in training and capacity development programmes of farmers groups/cooperatives. Moreover, the development of thematic knowledge products related to gender and women empowerment is also given importance and emphasized in gender mainstreaming.

CARLEP supported approximately 102,566 beneficiaries, with women comprising 50% of recipients. Women's participation in farmers' groups and cooperatives remains strong, representing 48% of total membership, though their representation in leadership positions stands at 32%. The project has also successfully promoted women's economic empowerment through the establishment of women-only groups, several of which have shown notable success. Women's involvement in community decision making continues to expand through their participation in local bodies such as water user associations (WUAs). In 2023-24, five new WUAs were established, with women making up 45% of their membership, further strengthening women's role in community governance and resource management. CARLEP has developed a gender strategy to address all three IFAD GEWE objectives of economic empowerment, voice and influence, and equitable sharing of workload and benefits. The gender-related impacts show strong potential for sustainability, evidenced by women's leadership in successful enterprises like the Zhonggar Nazhoen dairy processing group and their increased representation in decision-making bodies. The establishment of women-led cooperatives and enterprises with secured market linkages, combined with labour-saving technologies and strengthened capacity in business management, provides a solid foundation for continued women's economic empowerment beyond project completion.

CARLEP continues to enhance women's access to and control over assets through comprehensive capacity building, field demonstrations, and the provision of drudgery-reducing equipment. Technologies such as chaff cutters, biogas units, protected cultivation systems, dairy equipment, and smart irrigation systems are made equally accessible to women, significantly reducing their workload and improving overall wellbeing. Women beneficiaries report that biogas installations, for instance, allow them to multitask while cooking and provide a healthier cooking environment, eliminating the tedious cleaning associated with firewood use. Given that women predominate in agriculture and dairy value chains, and considering the challenges posed by difficult terrain and farm labor shortages, labor-saving devices were provided on a cost-sharing basis, particularly targeting women and households with persons with disabilities, to further promote gender equality and social inclusion.

The Zhonggar Nazhoen Gonor Gongphel Detshen, Mongar's first women-led dairy processing and marketing group operating since 2019, had five-member female group serves as a reliable market for seven dairy groups in Mongar, processing and selling dairy products (yoghurt, paneer, butter, cottage cheese, and ice cream) to schools, hospitals, the local market, Gyalsung Institute, and through their town outlet. The group collects 500-600 liters of milk daily at Nu. 39/liter, generating an average monthly income of Nu. 600,000. They plan to increase both their milk purchase price and intake capacity to 1,000 liters/day, subject to milk availability. The group exemplifies good governance and financial literacy, rotating leadership roles monthly and maintaining proper financial records. Their efficient workflow allows members to complete activities by midday, balancing work with family responsibilities through equitable workload distribution, including spousal support with household tasks.

For example, Phosorong dairy group (8 female, 2 male members), which benefits from a project-constructed MCC and maintains strong links with the processing group expressed satisfaction with their assured market access and CARLEP's dairy development support, which provides them with steady income.

A multitude of training initiatives, capacity-building programs, and the promotion of innovative technologies, including biogas, permaculture, enhanced cattle management, artificial insemination (AI), lead farmer models, and climate-resilient agricultural practices, serve as pivotal strategies aimed at empowering the project's target beneficiaries broadening their development horizons. These interventions constitute a key investment in human capital, while concurrently fostering the establishment and reinforcement of farmer groups, thereby enhancing social capital within the project's purview. Of significant note is the empowerment of rural women and men, particularly those in economically disadvantaged circumstances. The project has provided robust support for their individual development and has fortified their respective organizations. Through these capacity development programs, beneficiaries gain a measure of control over economic relationships and institutions, enabling active participation in local decision-making processes.

The operation of farm machinery and equipment is mainly done by men. However, women are also involved in operation of farm equipment like mils, dairy equipment, and post-harvest and processing equipment. Majority of the households stated that women are involved in the entire decision making at the household levels ranging from participation in meetings and trainings to sale of assets and purchases of farm inputs, keeping the household earnings and making investments.

5.4 Climate change adaptation

CARLEP implemented Climate Smart Agriculture (CSA) strategies across the project area, integrating climate adaptation considerations from the planning stage of each infrastructure project. To address water scarcity exacerbated by climate change, CARLEP introduced multipurpose water tanks that serve both drinking and irrigation needs during dry periods, as well as rainwater harvesting systems. Efficient irrigation technologies, including drip and sprinkler systems, were adopted in greenhouses under protected agriculture practices. CARLEP also introduced dryland irrigation, a novel approach in the region, enhancing water availability in previously underutilized areas. Furthermore, pipe-based irrigation systems for wetlands were

carefully aligned to avoid landslide-prone and erosion-susceptible zones, ensuring long-term sustainability. The project's ambitious million-fruit tree program and fruit intensification initiatives, complemented by the hazelnut program, contributed significantly to carbon sequestration. The project also somehow attributed to natural carbon sinks with the fallow lands of 62,841 acres (39% of dryland and 5,729 acres 33% of wetland) across six Dzongkhags. These areas, covered with vegetation ranging from bushes to trees, not only prevent soil erosion but also enhance biodiversity and provide wildlife habitat, demonstrating how even unused agricultural land can deliver valuable ecosystem services under proper management.

Around 95% of gewogs in the CARLEP target area have developed climate change resilient plans by adopting a variety of Climate Smart Agriculture (CSA) strategies to address climate challenges, focusing on smallholder resilience through training and climate-adaptive infrastructure. Given the reduced rainfall and frequent droughts, CARLEP introduced multi-purpose water tanks and rainwater harvesting for reliable irrigation, along with drip and sprinkler systems in greenhouses. A new dryland irrigation system, previously unused in the area, was introduced, and pipe-based wetland irrigation was carefully installed to avoid erosion-prone areas. To support clean energy, CARLEP promoted family-sized biogas units, offering subsidies for biogas appliances that covered half the installation cost. These biogas units provided clean cooking fuel, reduced the need for commercial gas and firewood, and generated bio-slurry fertilizer for vegetable crops. In 2023-2024, 36 biogas digesters were installed across four Dzongkhags. CARLEP also intensified production of Adzuki beans, distributing 1,685 kg of seeds to cover 112 acres across 800 households, with a buyback system to promote income stability. Farmers received drought-tolerant vegetable seeds for cauliflower and radish through a cost sharing scheme, while nearly 21,000 asparagus seedlings were provided to boost production. To enhance soil fertility, CARLEP trained farmers in organic soil enrichment practices, such as liquid manure and bokashi, promoting low-cost, eco-friendly solutions. Additionally, CARLEP introduced greenhouse solar dryers to help farmers preserve produce, particularly during the monsoon. In 2023-2024, ten solar dryers were distributed to vegetable growers, with 80% of the cost covered by the project. The program promoted drip irrigation systems to enhance orchard productivity in areas with water scarcity, installing efficient systems in citrus and kiwi orchards on a cost-sharing basis. Roof-top rainwater harvesting units were also installed in areas facing water shortages, benefiting 44 households. CARLEP's training initiatives in orchard and irrigation management, kiwi trellising, strawberry cultivation, and mushroom farming bolstered farmer skills, prepared them for sustainable agricultural practices. During the 2023-2024 fiscal year, CARLEP renovated 2.5 kilometers of irrigation canals, benefiting 48 households and supporting 42 acres of farmland. Seven dryland irrigation schemes were established, covering 17.2 kilometers and serving 68 households, using a cost-sharing approach for labor and materials.

To boost household food security and adapt to changing climate, 1520 kg of low water requiring indigenous upland paddy (Khangma maap) was distributed in Khoma and Jarey gewogs under Lhuentse Dzongkhag covering 76 acres. About 56,000 kg of upland paddy is expected from the two gewogs. An intensification of Wengkhar hybrid maize-1 (WHM 1) was, for the first time, carried out in Tsakaling and Waichur under Mongar dzongkhag covering 6 acres which yielded 2300 kg per hectare. All planned infrastructure works are taking climate change consideration into account at planning stage. To address water scarcity issues, CARLEP is employing coping strategies such as constructing multi-purpose water tanks (both for drinking water supply and to

supplement irrigation water during low flow conditions), rain water harvesting, and effectively introducing water efficient irrigation schemes such as drip and sprinkler under protected agriculture (greenhouses). Further, the pipe-based wetland irrigation schemes are properly aligned while giving due considerations to areas vulnerable to land sliding/soil erosion.

The CSVs are strengthened through installation of biogas units and permaculture. The CSV in Pheluma has 48 households under Orong gewog of Samdrup Jongkhar Dzongkhag. Together with Samdrup Jongkhar Initiative (SJI), promotion of organic soil fertility, plant protection technologies and organic cultivation practices were carried out. Three-days hands-on training on preparation and application of organic soil fertility management and plant protection technologies such as farmyard manure composting, biochar, Jeevamrut and Jholmol (biopesticide) were provided to the farmers. Organic cultivation practices such as crop rotation and companion cropping were also taught. A hands-on Permaculture Training at LUC site Thamdrang under Silambi gewog of Mongar Dzongkhag was conducted from 18-27 January 2023 on farm designing. The 10-day training was organized by CARLEP in collaboration with HASERA Agriculture Research and Training Center, Nepal with an objective to create and design LUC, Thamdrang as a Permaculture Model Farm and Learning Centre, which will be first of its kind in Bhutan. The training was attended by 12 participants from various agencies.

The construction of family-sized (4 m3 or 6 m3) biogas units were facilitated through subsidy support in the form of biogas appliances equivalent to 50% of the unit cost. Biogas technology not only ensured the production of clean energy for cooking but also enabled household sanitation and the production of bio-slurry fertilizer which can be productively used in vegetable farming which is especially useful to women. Farmers had reported a significant reduction in the purchase of LPG, and use of firewood and electricity for cooking and lighting after biogas units were installed. From 2022-2023, 31 biogas units were installed in five Dzongkhags (except Samdrup Jongkhar) and the cumulative number has risen to 789 units since 2017.

During 2022-2023, a total of 250 efficient irrigation technology units were promoted in Lhuentse (350% achieved), Samdrup Jongkhar (250%), Tashigang (200%) and Tashi Yangtse (400%). A cumulative figure of 1074 units of efficient irrigation sets installed between 2017 and 2023. In addition, roof-top rainwater harvesting technology was promoted in areas where there is acute shortage of water. Under the scheme, the farmers were supported with storage tank construction by supplying cement, rain gutter, reducer, pipes and skilled manpower while the beneficiaries contributed locally available materials such as sand, gravels and labour. A total of 53 households (Mongar 37, Pemagatshel 6, Tashigang 10) adopted rainwater harvesting technology in 2022-2023 and the cumulative figure has reached 125 households between 2017 and 2023. Additionally, 10 households under Trashigang Dzongkhag have adopted rainwater harvesting ponds to conserve water to be used during dry seasons. CARLEP supported the beneficiaries with 300 GSM plastic in the pond to prevent seepage while the beneficiaries contributed labour for pond digging.

Phrokpalung under Chaskhar gewog of Mongar where 31 acres of fallow paddy field was reverted into use again. A reservoir tank with capacity of 192,000 litres was constructed with 4.5 km pipe networking at a cost of Nu.5.062 million from CARLEP which benefitted 52 households. The fallow land was reverted at a cost of Nu.80,000 per acre in first clearing the bushes and then tilling the land with power tillers and manually by men. About 30 households has planned to construct

semi-permanent houses in the reverted fallow land to make better use of the land as reported by Chaskhar Gup. The place is ideal for mango and avocado fruit intensification and vegetables which can be easily sold on the highway. The irrigation water can be used for the avocado trees in winter.

5.5 Environment and natural resource management

CARLEP has made substantial contributions to natural resource management across eastern Bhutan through its integrated and innovative approaches. The project has effectively supported land development programs and water management technologies through ARDC, notably implementing dryland irrigation through piped networks and smart irrigation systems in orchards to reduce erosion and optimize water use. The project's biogas initiative has delivered multiple environmental benefits - reducing pressure on forests by decreasing firewood extraction, while the resulting bio slurry provided organic nutrients for vegetable and fruit production. CARLEP has further promoted sustainable soil management through vermiculture, biochar, and bokashi production, successfully commercializing organic manure production. The land development scheme, particularly dryland terracing, has both enhanced productivity and prevented soil erosion. The introduction of improved fodder management practices, including silage making and treatment of crop residues, has helped to reduce grazing pressure on forests.

There is improvement of natural resource base in the project target area and the pressure on the environment has been reduced. Project also supports and promotes hygienic cow sheds and fodder production in fallow and marginal land through supply of fodder seeds and fodder conservation through silage making and treatment of paddy/maize straws – thus reducing grazing pressure on the forests.

5.6 Social, Environment, and Climate Risks/Impact and Mitigation

The project's interventions have factored in social considerations and risks to ensure the broad inclusivity of its initiatives. CARLEP, driven by a commitment to environmental sustainability, actively advocates for eco-friendly agricultural practices among farmers, including the promotion and upscaling of bio-fertilizers and pesticides, as well as the promotion of vermicompost. Pressure on forests has been reduced by fostering fodder production and implementing stall-feeding practices. The project's emphasis on climate adaptation has been manifested in the establishment of climate-smart villages. Support is channeled into critical activities such as greenhouses and the adoption of efficient irrigation techniques, alongside the promotion of climate-resilient crop varieties. The climate-sensitive design principles have been meticulously integrated into all infrastructure development, underscoring the project's holistic approach to climate resilience.

The project has developed a comprehensive Social, Environmental, and Climate Assessment Procedure (SECAP) document. It has identified key concerns and outlined an array of measures aimed at mitigation. Furthermore, CARLEP is actively engaged in the diversification of energy sources along the milk value chain. This initiative entails the conversion of a minimum of three milk chilling centers (MCCs) to incorporate solar energy solutions, facilitating the operation of deep freezers, chillers, refrigeration, and lighting systems. The project is also poised to explore

more sustainable options for electric fencing, which may include the examination of alternative materials to replace or blend with existing wooden poles, potentially utilizing solar energy where feasible. Likewise, training on climate-smart technologies is also facilitated to enhance community resilience to climate change.

5.7 Targeting and outreach

Project has surpassed its household outreach target of 141,562 with 153,905 households (women-headed household of 16,015 against the target of 14,486) in the six Dzongkhags. The project has largely delivered on its targeting strategy objectives, particularly in reaching women-headed households and vulnerable groups. The project also monitors targeting performance through its M&E system and Annual Outcome Surveys. Based on monitoring outreach, the project has taken corrective measures, mainly regarding youth engagement. After observing high dropout rates from the Land Use Certificate (LUC) program due to remote locations and lack of basic infrastructure, CARLEP shifted its youth strategy toward more appealing interventions. These include support for mushroom enterprises, which have shown 100% adoption rate among trained youth, and engagement in agricultural marketing. The project also promoted youth participation in dairy processing units and as market aggregators, roles that better align with youth interests in business and technology while maintaining their connection to agriculture. The project maintains its focus on supporting vulnerable households through targeted interventions. In 2023-2024, 101 pro-poor households (44 female-headed) received support to establish backyard poultry farms, aimed at improving family nutrition, farm resilience, and income generation. Additionally, ARDC Wengkhar collaborated with Tarayana Foundation to establish a new climate smart village at Tsekpa, Jurmey Gewog in Mongar, providing support for organic soil fertility management, dry land irrigation, and heat tolerant vegetable seeds. To date, the project has established 13 Climate Smart Villages benefiting 344 households (165 female-headed) and has supported 21,515 households in building climate change resilience. The project's M&E system effectively tracks progress through sex-disaggregated data collection and gender-sensitive indicators.

5.8 Innovation

The programme supports the following innovations: (i) the lead farmer model for agricultural development; (ii) animal health service models; (iii) an e-agriculture platform; (iv) permaculture approaches; and (v) linking smallholder market development to the Bhutan commodity exchange. Although none of these innovations is new, their integrated application in Bhutan through the proposed programme is innovative. In addition, efforts to strengthen local institutions' capacity for improved outreach and sustainability in collaboration with government service networks have not previously been undertaken in Bhutan in an integrated manner. Linking technical innovation with the development of new models is a significant innovation in Bhutan.

One area of innovation is that of green house. Since the vegetable cultivation in greenhouses have become increasingly popular among farmers, ARDC Wengkhar have come up with modified version to address the issues of excessive heat in traditional greenhouses. The modified greenhouse consists of 30 x 5 m green house with increased height to mitigate heat buildup and enhance crop growth with advanced features such as trellising systems made of durable MS tubular rods and GI

wire, and automated irrigation systems. The main focus of these greenhouses is to facilitate the cultivation of tomatoes and chilies, especially during the off-season.

CARLEP has also supported for introduction of hot callusing technology (HCT) for enhanced walnut propagation to a private nursery operator at Mongar on cost sharing mechanism after successful implementation in Drepong where a success rate of 76% was achieved. The main objective is to significantly increase the graft success rate of walnut seedlings, thereby boosting income through the sale of high-value seedlings. Walnuts, recognized as a key commodity with high market value and demand, with grafted seedlings commanding prices between Nu 275 and Nu 305 per seedling. However, walnut seedlings typically exhibit lower graft success rates compared to other fruit species, primarily due to the specific temperature (27°C) and relative humidity (80-90%) required at the graft union for successful formation. Since HCT ensures a constant temperature of 27°C and optimal humidity at the graft union by circulating hot water (heated to 50-55°C) from a reservoir tank regulated by automated sensors. The walnut seedlings were grafted and remains inside the callusing pipe for four weeks until the callus formation is complete. The process is remotely monitored through the “eWeLink” app, allowing for precise control of both external and internal conditions. Moreover, the HCT system’s vertical stacking design maximizes space, making it ideal for nurseries in peri-urban areas. In a 5x11m net house, 1,440 seedlings can be accommodated efficiently with an anticipated graft success rate of 70-80%, the projected income from the sale of seedlings is estimated between Nu 277,200 and Nu 316,800.

Another is the permaculture which is a holistic agricultural and social design approach that combines plants, animals, and people to create sustainable ecosystems. Integrating ponds into permaculture design aligns with principles of sustainability, resilience, and ecosystem health. This practice enhances the creation of productive and balanced landscapes through effective water management, increased biodiversity, 13 efficient nutrient cycling, microclimate regulation, and habitat creation.

5.9 Scaling-up

CARLEP stands ready for significant scaling-up, that potential being paved for through a series of impactful initiatives that have garnered enthusiastic participation from various stakeholders, including youth, women, farmer groups, local authorities, aggregators and traders. These initiatives encompass a wide array of interventions, such as protected horticulture, agricultural processing, business-to-business linkages, and dairy farming, with the latter being bolstered by the reliable support of Koufuku International as a stable outlet for fresh milk. CARLEP demonstrates its unwavering commitment to engaging and empowering the youth through targeted investments, including mushroom production, fallow land conversion and support to aggregators. Another compelling indicator of CARLEP's scaling-up potential lies in the discernible adoption of its lessons and best practices by other development projects in Bhutan. CARLEP activities are being included in the plans and programmes of local governments, with specific budgets to allow for replication and scaling up. GAFSP has provided funding to scale-up CARLEP activities through the recently initiated IFAD BRECSA project.

Further, there is potential to scale-up through strengthening PPP model (CARTLEP’s successful collaboration with Koufuko International Limited and BAIL) which demonstrates how structured partnership can create a sustainable marketing system. Similarly, the success of upland paddy

cultivation, where the introduction of Khangma Maap variety transformed local food security, offers important lessons for expanding Bhutan's rice self-sufficiency. The success of the Eastern Agriculture Marketing Cooperative (EAMC), the first of its kind in Bhutan, demonstrates the power of well-structured aggregation systems in transforming rural marketing. EAMC's model of integrating backward linkages with over 2,000 farmers across six dzongkhags through collection centres. EAMC provides input and cash to farmers in advance, as well as advisory services to respond to market demand. Additionally, EAMC establishes forward market linkages through efficient transportation networks and institutional buyers. Transforming fallow and marginal lands into productive agricultural areas through a combination of terracing, irrigation and mechanization support. This comprehensive approach has proven effective in enhancing farm viability and should be institutionalized in national agricultural development programs. Enhance Youth-Focused Enterprise Support: Building on CARLEP's experience with matching grants and enterprise development support for educated youth, particularly in high-value sectors like mushroom cultivation and nursery development.

CARLEP is also diligently nurturing robust business growth and fostering linkages between farmers and markets. In this endeavor, the project is upgrading service delivery, enhancing climate-resilient production infrastructure, promoting resilient seed varieties and breeds. Simultaneously CARLEP is actively promoting commercialization and investing in the empowerment and active engagement, of Farmer Groups and Cooperatives. These entities are being guided towards evolving into self-sustaining enterprises, well-equipped to elevate their production capacities, amplify productivity levels, and stimulate wider economic opportunities. This transformative process is instrumental in the recalibration of the rural agricultural landscape in eastern Bhutan.

6. Project Efficiency

6.1 Project costs and financing

The programme was be financed by: (i) an IFAD loan of approximately US$8.27 million (26.2 per cent of the total programme cost); (ii) an IFAD grant of approximately US$1.06 million (3.4 per cent of the total cost); (iii) an ASAP grant of approximately US$5.02 million (15.9 per cent of the total cost); (iv) a mainly in-kind beneficiary contribution estimated at US$0.66 million (2.1 per cent of the total cost); (v) a contribution by the Government of approximately US$5.77 million (18.3 percent of the total cost); (vi) cofinancing from FCBL of US$4.81 million, mainly through recurrent costs (15.2 per cent of the total cost); and (vii) a financing gap of approximately US$6 million (19 per cent of the total cost) subject to country selection and applicable and available additional financing from the 2016-2018 or 2019-2021 PBAS allocations or cofinancing. The Government finance on taxes and duties, most of the recurrent costs, re-training (in line with the mandate of the MoAF) and dairy inputs.

Table 5: Project expenditure as of 2023-24 fiscal year (in millions)

Financing	Budget (BTN)	Expense (BTN)	Progress (BTN)	Budget (USD)	Expense (USD)	Progress (USD)
Grant I	1,624.564	1,271.643	78.28%	22.238	17.293	77.76%

Grant II	1798.248	1019.757	56.71%	14.998	13.097	87.32%
Loan I	1491.089	1170.947	78.53%	20.587	16.039	77.91%
Loan II	1158.508	1008.024	87.01%	14.821	12.947	87.36%
RGoB	1458.105	1133.648	77.75%	20.242	15.592	77.03%
ASAP	1764.565	1401.784	79.44%	23.847	18.797	78.82%
Beneficiary contribution	58.395	0	0.00%	0.892	0	0.00%
FCBL contribution	223.608	1.792	0.80%	3.394	0.028	0.82%
Total	**9,577.082**	**7,007.595**	**73.17%**	**121.019**	**93.793**	**77.50%**

The project has well progressed in term of financial expenditure, as illustrated in Table 4. About 77% of total budget (in USD) has been spent by end of 2024. The total programme cost is estimated at US$31.59 million over seven years, including contingencies. The total base costs equal US$24.18 million and physical and price contingencies account for US$1.86 million and US$5.55 million respectively (8 percent and 23 percent respectively of total base costs). Investment costs are estimated at US$26.18million (83 percent of the total cost) while recurrent costs are estimated at US$5.41 million (17 percent of the total cost).

Table 6: Budget head wise expenditure as of 2023-24 fiscal year (in millions BTN)

	Budget	Expenses	% actual	% share of expense
Consultancy	255.859	208.927	81.66%	2.74%
Equipment & materials	618.310	506.635	81.94%	6.65%
Goods, Services, input	1,755.793	1,408.308	80.21%	18.49%
Operation	1,638.836	1,272.643	77.66%	16.71%
Training	1,771.857	1,403.114	79.19%	18.42%
Works	1,772.920	1,408.323	79.44%	18.49%
Workshop	1,777.676	1,408.446	79.23%	18.49%
Total	**9,591.251**	**7,616.396**	**79.41%**	

There is almost equal distribution of expenses for all the work heads if we look into the percentage share of expenses with lower share to consultancy and equipment or materials. Even in terms of four project components, the percentage expenses are around 80% as shown in the table 7 below.

Table 7: Sector wise expenditure as of 2023-24 fiscal year (in millions BTN)

	Agriculture		**Livestock**		**Marketing**		**Management**		**Total**	
	Budget	**Expense**	**Budget**	**Expense**	**Budget**	**Expense**	**Budget**	**Expense**	**Budget**	**Expense**
2015-2016	510.18	374.05	1,775.79	1,408.31	0.00	0.00	24.728	4.769	2,310.70	1,787.12
2016-2017	435.13	349.79	435.16	335.06	5.40	4.481	50.56	10.928	926.25	700.25
2017-2018	301.14	247.86	293.18	226.32	11.06	10.401	70.89	23.996	676.26	508.58
2018-2019	217.55	146.75	154.76	91.47	10.86	10.043	1057.896	858.247	1,441.07	1,106.51
2019-2020	223.08	213.05	261.71	241.49	11.89	9.283	1028.991	846.253	1,525.67	1,310.08
2020-2021	556.49	481.61	974.91	844.25	7.50	7.387	588.826	462.818	2,127.72	1,796.06
2021-2022	487.97	397.16	775.07	687.75	74.00	53.601	20.169	14.385	1,357.21	1,152.90
2022-2023	1,212.81	988.23	1,209.84	985.66	15.48	7.085	811.338	722.804	3,249.47	2,703.78
2023-2024	158.11	140.94	173.79	155.02	19.56	18.846	29.989	25.989	381.45	340.80
Total	**4,102.45**	**3,339.44**	**6,054.20**	**4,975.33**	**155.75**	**121.13**	**3,683.39**	**2,970.19**	**13,995.80**	**11,406.08**

Table 8: Component wise expenditure as of 2023-24 fiscal year (in millions BTN)

	Component 1: Market Led Sustainable Agriculture Production			Component 2: Value Chain Development and Marketing Support			Component 3: Institutional Support & Policy Development			Component 4: Project management, Coordination and M&E		
Financing	Budget	Expense	%	Budget	Expense	%	Budget	Expense	%	Budget	Expense	%
Grant 1	1392.068	1086.282	78.03%	1081.416	882.620	81.62%	674.890	607.290	89.98%	1308.076	1063.876	81.33%
Grant 2	4.000	2.660	66.50%	0.490	0.197	40.20%	134.522	96.366	71.64%	1172.369	1019.757	86.98%
Loan 1	1491.089	1170.947	78.53%	1112.098	912.057	82.01%	629.500	490.039	77.85%	307.946	198.641	64.51%
Loan 2	1158.508	1008.024	87.01%	607.826	497.348	81.82%				0.554	0.553	99.82%
RGOB	1248.095	961.553	77.04%							1457.161	1133.648	77.80%
ASAP	1764.565	1401.784	79.44%	1439.497	1185.592	82.36%	539.323	414.268	76.81%	653.328	513.327	78.57%
Beneficiary	57.740		0.00%	29.410		0.00%				1.400		0.00%
FCBL	223.608	1.792	0.80%									
Total	**7339.673**	**5633.042**	**76.75%**	**4270.737**	**3477.814**	**81.43%**	**1978.235**	**1607.963**	**81.28%**	**4900.834**	**3929.802**	**80.19%**

6.2 Timeliness

The CARLEP project has experienced extensions, impacting its original timeline. Initially launched in 2016 as a seven-year project but was extended to 2025 with additional financing. A further extension will be also possible due to additional works which need to take up as per the demand from the stakeholders and beneficiaries. The project aims to enhance climate-resilient agriculture and improve livelihoods for smallholder farmers in eastern Bhutan.

From the IFAD side, timely supervision missions were conducted to review the performance of the programme and to assess the overall progress and examine the likelihood of achieving the Programme's development objectives in the remaining project period. It was also to review plan of the Office of the Programme Management and provide necessary support for the timely completion, assess the level of adequacy of data and information available and develop tools and techniques for additional data collection (if required) besides supporting the programme team to resolve any bottlenecks or emerging issues.

The programme was audited timely by the supreme audit institution of Bhutan by the Royal Audit Authority in order to scrutinize with regard to its implementation, particularly the issues such as incomplete or poorly executed activities despite the fund releases. The audit also indicated some of the commendable achievement made by the project towards fulfilling the project objectives. With timely intervention of audits highlighting the issues has enabled the project come up with significant improvement and in achieving its goals of transforming agriculture in the eastern Dzongkhags.

6.3 Economic and Financial Analysis

CARLEP aim is to shift the country's agricultural sector from subsistence farming to a market-driven sustainable system by focusing on strengthening the value chains, improving market access, and enhancing livelihoods, particularly for women and youth in eastern districts. The project also improved agricultural infrastructure and strengthen farmer organizations. The goal is to improve market access for farmers, connecting them with potential buyers and reducing reliance on subsistence farming by establishing multi-stakeholder platforms to facilitate connections between producers and markets. In the process, project invested in marketing facilities to support agricultural production and trade. The project has also strengthened farmers' organizations, including groups and cooperatives, to improve their capacity to engage with markets. Participation of women and youth in the value chains is another area of focus of the project to recognize their contributions to economic development. The project intervention has increased agricultural production, improved income of farmers, and contributed to the overall economic development of the region. Strengthening of Kofuco International in Trashigang has created a significant market for milk production in the eastern region.

Immediate benefits include increased vegetable and dairy production, greater use of sustainable agricultural practices, increased access to extension and market information, sustainable extension services, market access through consolidation of production, enterprise establishment and greater employment opportunities. Indirect benefits include enhanced rural employment, strengthened climate resilience and improved household nutrition.

Improved farming practices resulted in productivity increase in a range of 30% and 40%. The IRR is calculated for all the overall project. Incremental net benefits at full development were used for the project investment. Adoption rate of each farm enterprises is estimated to range between 52% and 90% with an average of 63%. The project economic costs are direct expenditures after adjusting for taxes and inflations but inclusive of physical contingencies. Recurrent costs for project operations are also included. Economic prices for inputs and outputs models were estimated by applying conversion factors on financial prices. Inputs and outputs prices were collected from the field report. Key environmental benefits were increased rural employment, social mobilization and effective participation of smallholder farmers, linkages with rural economy and markets and overall reduction in vulnerability.

All crop and farm models analysed are profitable, yielding positive net present value. Economic analysis of the programme based on financial models and using economic prices shows it to be profitable, with an estimated net present value of Nu.3,198.99 million and an internal rate of return of 13.12 per cent at a discount rate of 10 per cent.

6.4 Key indicators from VfM analysis

The comprehensive program outreach has encompassed 102% of its intended scope, engaging 29,546 households out of a total target of 28,975. Insights garnered from the Annual Outcome Survey reveal a substantial enhancement in mean monthly income, soaring to Nu.14,511, with an impressive 30.9% surge in household income. A remarkable 85% of households reported self-sufficiency in food production, and all households have embraced at least one improved agricultural technology. For mushrooms and the dairy sector, production has gone up further than what was initially anticipated. During 2023 financial year, the mushroom enterprises have generated approximately Nu. 1.1 million. Another compelling testament to the project's value for money is exemplified by the reclamation of fallow lands. Supported by irrigation infrastructure, including storage tanks and an intricate network of pipes such as 50 households in Chaskhar gewog have successfully brought 31 acres of fallow land back into productive use yielding paddy of around 1336 kg/acre. The first-year harvest promised a return of Nu.3,727,440 from the 31 acres, an admirable outcome against investment of Nu.5,062,000.

Several other interventions of CARLEP are proving to render a high value for money invested such as the vegetable, fruit and dairy intensification programs. Other supporting programmes like the land development, fencing, infrastructure and irrigation contribute immensely towards increased income. The crop depredation by wild animals is seen as the most severe non-climatic hazard confronting the villages. Hence, electric fencing and other types of fencing such as chain-link fencing has been promoted to reduce crop loss to wildlife which has greatly helped farmers in protecting their crops from wildlife damage, while increasing household food self-sufficiency. One of the activities which will surely payoff is the intensification of different types of fruit trees depending on the altitude. This will not only ensure steady income to the farmers but also mitigate climate change through carbon sequestration.

The dryland irrigation through network of pipes and smart irrigation, as well as the vegetable and fruit intensification program are also a measure to address effects of climate change. In some areas

such as Jurmey gewog under Mongar Dzongkhag, dryland irrigation has been a boon as drinking water has solved one of the major issues of the community and increased sanitation. In other words, there are many benefits of dryland irrigation. The dairy intensification program with subsidy for purchase of cows, establishment of milk collection centres, improving dairy sheds and conserving fodder are also proving value for money as they contribute towards uplifting the standards of small dairy farmers.

Of the total allocation of funds to the project including additional financing by IFAD, about 43% has been utilized till the end of September 2021. The physical targets have been much higher which indicates that the cost of implementing the activities was less than what was originally budgeted for and the funds have been economically utilized resulting in a higher value for money.

A lift irrigation system in Trashiyangtse was undertaken by the project at a cost of Nu. 3.90 million, benefitting 27 households over 21 acres. The resultant income from the crops produced was Nu. 0.3 million in just one production season, which is about 10% of the cost of the scheme. Similarly, in the case of Mushroom production, a Mushroom Spawn Production Unit (MSPU) was set up with the investment cost of Nu. 293,350 towards equipment which resulted in production of 1600 bottles of oyster spawn in a year worth of Nu. 160,000 which is about 55% return on investment.

VfM category	**Performance**	**Supporting evidence**
Economy (spending less)	Effective mobilization and use of committed funds	a) Project showed effective financial management and a strong uptake of funds by beneficiaries b) Sustained financial implementation despite earlier pandemic delays c) Significant investment made to deliver widespread benefits to smallholder households in the 6 eastern dzongkhags
Efficiency (spending well)	High output performance	a) Project management consistently exceeded targets for key outputs b) Although project faced challenges due to staff turnover, even then all project activities were efficiently delivered in every reporting period
Effectiveness (spending wisely)	Achieved significant positive impacts on smallholder livelihoods.	a) Successfully moved vulnerable households from subsistence farming to more sustainable, commercial, and climate-resilient livelihoods. b) supported youth enterprises in off-farm activities, such as mushroom cultivation and vermicompost production, to promote diversified income and reduce labor intensity. c) Exceeded its outreach target with significant participation from female-headed households. d) Successful, innovative activities such as climate-smart practices and value chain improvements are being scaled up and integrated into the project.

		e) Program successfully developed resilient vegetable and dairy value chains
Equity (reaching all)	Reached and exceeded outreach goals with an inclusive approach	a) Project interventions included all stakeholder irrespective of gender and disadvantage people. b) Support provided to both urban and rural beneficiaries
Sustainability (lasting impact)	Integrated long-term viability into project design.	a) Focused on improving the capacity building of farmers and local institutions for long term sustainability of project interventions. b) Partnerships established within various market value chain actors c) Developed various project documents and best practices to support long term project support

7. Partners' performance

7.1 Performance of IFAD

IFAD's performance in relation to the CARLEP has been positive, with the program building on IFAD's long-standing partnership with the Royal Government of Bhutan demonstrating a sustained commitment to agricultural development in the region. The focus was on strengthening value chains, promoting climate-smart agriculture, and improving market access for farmers in six eastern dzongkhags. The program supported various agricultural activities, including dairy production, vegetable farming, and fruit cultivation. For example, project carried out intensification and expansion of dairy production by providing subsidies for dairy cows, constructing hygienic cow sheds, and distributing fodder seeds and planting materials.

IFAD emphasized the importance of efficient and economical procurement processes to avoid delays and ensure value for money in project-related activities. The performance of IFAD has been positive contributing to significant advancements in agricultural production, value chain development, and livelihoods. The program's focus on climate-smart agriculture, inclusivity, and stakeholder participation strengthened its potential for sustainable impact.

IFAD has provided issue-based solutions as well as integrated implementation and supervision supports. It has well recorded process monitoring format and Management Information System (MIS) on project inputs and its results. The web-based MIS was adapted in later part of the project, which has helped to synchronize all the key data and information of the project at one platform. Further, the project has mechanism of partner-based supervision and implementation support which is found to be effective for making collaboration effective and viable across range of partners. The project has allocated budget to each government line of agencies in the districts for regular monitoring of the project in their jurisdictions. Some supports and facilitations for training, etc., for implementation of field- based activities were provided through these partners and government line agencies. These governmental line agencies provide training to the farmers, whose support during implementation of activities was found to be very important.

The annual supervision mission conducted by IFAD was aimed to review the program's performance, assess progress, and evaluate the likelihood of achieving its objectives. These missions, which typically involve both international and national experts, visited project sites, interact with beneficiaries and stakeholders, and review various aspects of the project, including financial management, procurement, and gender mainstreaming. The missions also provided support for upcoming project completion reviews and address any bottlenecks or emerging issues. The mission teams included international consultants and national experts, often with specialists in areas like agronomy, climate change, finance, and procurement. The supervision missions assessed the project's effectiveness in terms of targets and outreach, gender equality and women's participation, agricultural productivity, and knowledge management. It plays a crucial role in preparing for the project completion review, assess data adequacy, and developing tools for data collection if required. During the missions, it was found to be effective to discuss and solve some of the issues and challenges faced by the project and if any changes are required in the project targets by involving other agencies such as the Dzongkhag officials, other programmes and the key government officials.

7.2 Performance of the Government

CARLEP has shown positive results in several key areas including increasing household assets, reducing child malnutrition, and supporting smallholder farmers in adapting to climate change. Project has also focused on expanding fruit production, promoting commercial vegetable farming, and supporting youth in off-farm enterprises. Thus, with the support from the Royal Government of Bhutan saw notable increase in vegetable production and significant growth in farmer incomes through sale of produce to schools and institutions.

Programme activities were reflected in the Government’s planning and monitoring system with the establishment of monitoring and evaluation (M&E) unit within the OPM to ensure that all outputs, outcomes and impact indicators are included in the planning and monitoring system. The annual workplan and budget are the main planning tool used to review programme performance and progress. A knowledge management strategy was prepared to facilitate engagement in policy development related to resilient agriculture and dairy production, and marketing support. It includes strategies for strengthening market information systems and trainings. A strong knowledge-sharing and learning culture was built through the use of participatory tools and knowledge from M&E, and the development of knowledge products.

The Royal Government has initiated this project with full responsibility through the Ministry of Finance (MoF) as the borrowing agency taking nodal role to review and monitor the programme with designated focal officer in the Department of Public Accounts (DPA), responsible for coordinating with PMO/MoAF and IFAD for smooth fund flow, disbursements, preparing consolidated financial progress reports, clearing Withdrawal Applications and facilitating operation of the Designated Accounts. The Ministry of Agriculture and Forests (MoAF) is the Lead Programme Agency with overall responsibility for the programme for achieving programme results and to provide policy guidance and direction, make required technical staff available from their pool of civil servants for implementation, provide technical backstopping through its line departments and agencies in the field. PMO has been established with a National Programme Director along with dedicated staff of the project. The responsibility of the PMO included

implementation of the programme starting from planning to execution in line with the project requirements such as Annual Reports, baseline and impact surveys, Annual Outcome Surveys (AOS), Annual Work Plans and Budgets (AWPB), Annual Progress Reports, Statements of Expenditure (SOE), Withdrawal Applications (WA), Audit, etc. The office undertakes overall coordination of the programme planning, implementation, progress monitoring, knowledge generation, funds allocation and disbursements to implementing agencies and reporting results to RGoB and IFAD, besides also sharing knowledge and learning with key programme partners. PMO works under the overall guidance and direction of the National Programme Steering Committee (NPSC) at the national level and the Regional Programme Implementation Committee (RPIC) in the regions. The committee meetings were conducted as and when required for the project along with coordination meetings with different agencies and stakeholders. The overall success of the project as visible through the field consultations and the various reports published through the PMO indicates the overall performance of the government.

8. Sustainability

The programme incorporates many features designed to promote long-term sustainability such as by selecting a limited number of value chains, production support in specific areas and tailored to value chain planning needs to allow establishment of subsequent value chains. The programme has also built target communities' ownership through village-level planning and implementation, including investments in the development of operation and maintenance groups of assets. Links between production, marketing and enterprise development were forged to promote sharing of benefits between farmers and the private sector. Accountability and ownership by farmers were also built to allow for demand-driven services.

CARLEP has demonstrated exemplary influence in policy development and institutional strengthening through its evidence-based contributions and strategic engagement with key stakeholders. The project's most significant policy impact is evidenced in its close collaboration with the Ministry of Agriculture and Forests (MOAF) in revising the RNR 2040 Strategy, bringing practical insights from field implementation to national policy formulation. The project's success in promoting commercial agriculture and enhancing rural livelihoods has also influenced policy priorities in Bhutan's 13th Five Year Plan, particularly in areas of agricultural commercialization, climate-resilient farming practices, and youth engagement in agriculture. Another notable example of CARLEP's policy influence is its pioneering work on fallow land management in Bhutan. The project's assessment and development of guidelines for identifying and mapping uncultivated private, monastic, and state lands was subsequently adopted by the Land Commission and scaled up into a national fallow land bank, demonstrating how project-level initiatives can inform national policy frameworks. Project has also institutionalized multi-stakeholder engagement through its Multi Stakeholder Platform (MSP), which has become an effective mechanism for facilitating dialogue and trade between producers, buyers (including schools and aggregators), and other value chain actors.

CARLEP's remarkable success is fundamentally rooted in its exceptional ability to build, strengthen, and leverage strategic partnerships across multiple stakeholders. During the initial stage, implementing partners had varying levels of capacity, but through systematic engagement and targeted capacity building, CARLEP has transformed these relationships into a robust and

efficient implementation network. The project has masterfully enhanced the technical and operational capabilities of key agencies including ARDC, RLDC, and RAMCO, enabling them to deliver specialized services in agricultural research, livestock development, and market facilitation respectively. Strategic partnerships with institutions like the National Seed Centre and National Research Center for Animal Nutrition have evolved from basic collaboration to dynamic technical partnerships. Civil society organizations such as the Samdrup Jongkhar Initiative and Tarayana Foundation have grown into effective partners in reaching vulnerable communities, while the private sector engagement, particularly with KIL and BAIL, has matured into a sustainable market-driven partnership benefiting farmers. At the local level, CARLEP's investment in strengthening dzongkhag administrations' capacities has resulted in improved project implementation and technical support. The project's success in mobilizing and building the capacities of farmer groups and cooperatives has created strong grassroots institutions capable of sustaining project initiatives. This comprehensive partnership approach, characterized by mutual learning and shared responsibility, has not only enabled CARLEP to exceed its outreach targets but has also created a lasting institutional framework for agricultural development in eastern Bhutan.

CARLEP has developed a comprehensive exit and sustainability strategy that builds on its established success and partnerships. The strategy effectively addresses sustainability through multiple pathways, with particular emphasis on strengthening existing institutional arrangements and market linkages. A key component is the innovative approach to private sector engagement, notably through the partnership with Koufuku International Limited (KIL) and Bhutan Agro Industries Limited (BAIL). The project has also prioritized the development of robust farmer groups and cooperatives that can independently manage value chain activities post-project. These groups are being systematically strengthened in governance, financial management, and market linkages to ensure their continued operation. To ensure smooth transition, CARLEP plans to conduct comprehensive consultations with all concerned stakeholders, including implementing partners, farmer groups, private sector actors, and local government institutions, thereby securing their commitment to sustaining project initiatives beyond its completion. The mission recommended further strengthening of CARLEP's Exit and Sustainability Strategy by incorporating comprehensive policy measures for marketing enhancement, farmer group effectiveness, and knowledge management. Some of the key exit strategies include:

a) In order to ensure sustainability of the programme, it has been incorporated within the 13th FYP of the local government grants to secure program continuity in dairy and crop intensification and value chain establishment, expansion of dry land irrigation, market linked production planning for maize with feed companies and integrating apiculture with mustard and buckwheat intensification to gain synergy. Moreover, integrating climate and energy lessons through adoption of climate smart village (CSV) into the National Adaptation Plans will serve as entry point for securing global climate funds like GCF and GEF in upscaling/replication of CSVs across the country.

b) In addition, enterprise development will be pursued through national skilling and engagement program through financial literacy training, lead farmer and CAIT, dairy equipment repair Technician as service providers, private nursery and community-based seed growers for sustainable agriculture and livestock inputs linked through NSC, Alpine Seeds or with export companies and linking with the Cottage and Small Industries Support Grants.

c) Strengthening the value chain linkages through self-financing mechanisms such as Koufuku International as a center for dairy excellence will continue to play crucial role in expanding the dairy value chain and market linkages. As envisioned in Koufuko Internationals Corporate Strategy to bringing onboard dairy farmers as shareholder, dairy farmers in the region will be able to invest more into dairy farming with minimal support from the Government. Similarly, some of the most successful dairy cooperatives, not linked to Koufuko, will come up with a mechanism on how to plough back group savings to their members, so that the members have easy access to fund for purchase of inputs and other expenses.

d) Contractual farming model, where the Processors invest in establishment of the production farms and the growers supply their produce to them, will propel the agriculture intensification program and market-linkages. Thus, reinvestment strategy should be developed for the replication of the contractual farming model already adopted in the region. For example, linking of pineapple growers with BAIL at Lingmethang.

e) PPP model can be pursued to encourage investment in agriculture commercialization through aggregating fruit intensification villages and linking up with import and export agencies and developing business partnership (like apple and citrus export business) and establishment of commercial farms through landscape approach utilizing fallow lands (Land bank concept) under PPP model and also systematically integrating development support and credit investment.

9. Lessons and knowledge management

9.1 Lessons learnt

The Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) in Bhutan has yielded several key lessons. These include the importance of a shift towards market-oriented agriculture, the value of climate-smart farming practices, and the need for robust value chains. CARLEP also highlighted the significance of community participation, capacity building, and the integration of lessons learned from previous projects.

The project has successfully developed inclusive value chain systems of vegetable and dairy products in remotely located communities of eastern Bhutan by providing supports to all segments of value chain systems. For example, it has supported supply of input supplies for dairy production, establishment of dairy processing units, establishment of milk collection centre and also supported in market linkages. Similarly, the project has supported in each value chain component of vegetable production, construction of market sheds and market linkages. Similarly, the project was able to support in land management, seeds production, efficient irrigation system, collection centers to groups/cooperatives, technical supports from service providers to farmers, market shed or sales counters etc. This kind of support in complete package of value chain has led to development of self-sustaining cluster-based production and marketing, and for more income and assured access to market for each actor of the value chain.

Field evidence and consultation with several value chain groups and actors provided evidences that within the same plot of land, market-based production of high value crops or fruits have

potential for higher income than that of their engaging for subsistence based cereal crop production activities. The increased production and income in the previous season have also supported to enhance the productivity in the subsequent season of farming, due to more cash income with the farmers for purchasing other inputs (like seeds and fertilizers) for growing the vegetables or cereals. In fact, increased in income of smallholding farmers has very wider impacts on the incremental change on the household's assets, community involvement and influence on decision making process at the community level, and in development of secondary and tertiary markets.

The cost sharing mechanism model adapted in the project seems successfully working for strengthening of VC since there is shared responsibility and accountability. In earlier projects, when everything was provided by the project, beneficiaries were too dependent and, in most cases, once the project was completed, there were issues of not taking care of the infrastructure or the facilities. Since the project has handed over most of the facilities to the communities, it is the responsibility of the communities to management and operate those facilities.

Success and sustainability of a group and/or cooperative is very much connected with the understanding and sense of ownership members have with respect to their enterprise. Farmer groups and cooperatives be supported through mentoring on: financial literacy, governance and organizational development, entrepreneurship development, marketing, post-harvest management and access to finance. If well trained and developed, the FGs and Cooperatives are entities that can address the problem of the low scale of production and create expanded economic prospects.

It was learnt that strong management, access to proper equipment, and market linkages are crucial for sustainability. Community collaboration has boosted productivity and resilience. Thus, with timely support from the project, conducting practical training and timely budgeting are essential for smooth implementation and sustainability of the project.

More specifically, lessons learnt can be broken down into the following aspects:

Shift to Market-Oriented Agriculture: CARLEP moved beyond simply increasing agricultural production to focus on marketing and commercialization, recognizing the need for farmers to connect with markets and sell their produce.

Climate-Smart Approaches: The program emphasized climate-resilient farming techniques, promoting practices that can withstand changing weather patterns and improve long-term sustainability.

Value Chain Development: CARLEP highlighted the importance of strengthening the entire value chain, from production to processing and marketing, ensuring that farmers can benefit from their produce at each stage.

Community Engagement: The program demonstrated the crucial role of community participation and ownership in the success of agricultural development initiatives. Strong community involvement ensures that interventions are relevant, sustainable, and address local needs.

Capacity Building: CARLEP underscored the importance of providing farmers with training and technical support to adopt new technologies, improve their farming practices, and manage their businesses effectively.

Learning from Past Projects: The program was built upon lessons learned from previous agricultural interventions, demonstrating the value of continuous improvement and adaptation in development programs.

Strategic Market Infrastructure: CARLEP's focus on developing strategic market infrastructure, like collection centers and farm shops, helped to improve access to markets and reduce post-harvest losses.

Knowledge Management and Communication: The program emphasized the importance of effective knowledge management and communication strategies to disseminate information, share best practices, and ensure that lessons learned are integrated into future agricultural policies and strategies.

9.2 Knowledge management

CARLEP utilizes Knowledge Management (KM) to improve decision-making and performance in commercializing agricultural production and increasing smallholder incomes. Project knowledge management strategy focuses on facilitating the creation, sharing, and use of knowledge to change attitudes, behaviors, and work patterns, ultimately improving program effectiveness. This involved activities like developing knowledge management strategy, establishing a knowledge database, and coordinating with various stakeholders. Overall, the project has adopted a good system of documentation and sharing of knowledge and lesson learning with stakeholders. These lessons learning have been documented in trimester and annual report of the project. The project has published news bulletins regularly. Some of the learnings of the project have been published in well-read (face book pages) and nationally widely circulated daily newspapers (such as Kuensel).

CARLEP is recognized to be one of the projects producing good quality of KM related activities and to be very active in supporting IFAD thematic webinars. Since the early implementation, the project has been very active in producing a substantial amount of knowledge management related work and dissemination, including the compilation of stories, articles, pamphlets and audiovisual documentation. In collaboration with the ARDC, the project has produced video documentaries and tutorial videos with the scope to create awareness to farmers on advanced farming technologies, practices, and management. In total, CARLEP has finalized 18 audio-visual documentaries of which 9 were produced by OPM and ARDC using the internal capacity during the current year. In addition to the audio-visual KM products, CARLEP has also finalized a pamphlet on hydroponic fodder production with the aim of guiding farmers towards increasing fodder availability.

IFAD has also organized a webinar on a rural solution portal for knowledge dissemination and CARLEP has been involved in presenting the activities. The KM products produced are disseminated through various social media platforms such as IFAD ASIA, Facebook page, CARLEP Facebook page, YouTube Channel (KMG Production-ARDC Wengkhar and OPM), Official WeChat Group, and the official web page for the replication and adoption of the programme activities. Understanding that the videos and all success stories produced with the scope to showcase CARLEP’s intervention can remain limited to a few social media or few platforms, OPM has connected with local cable operators in eastern Bhutan to telecast tutorial

videos (DVDs/CDs) through local channels to grasp wider audiences or farmers for a wider outreach and knowledge dissemination. Project has also facilitated multiple write-shops for enhancing the writing skills and techniques of the extension staff.

10. Conclusions and recommendations

The CARLEP has supported investments in several value chain actors for both vegetable and dairy including establishment of infrastructure, input supplies and facilitated processing units. These investments have huge impacts in strengthening value chain for both dairy and vegetables with high scale multiplier effects not only in the local communities but also to the Dzongkhags and the nearby areas in the region. The market system, infrastructure development and business support to these tertiary level trading and agri-business needs to be further supported and facilitated for long term sustainability and for their effective functioning.

m) There is a need of setting up some sort of a mechanism in the CARLEP areas for continuously spending for maintenance of physical infrastructure developed. This can be done by taking support through the project or outside of project domain as well. Value chain groups are to be supported (and encouraged) to establish a kind of trust fund at each POs (or producers' group) by taking certain percentage of payments (percentage of the net benefits) received by the producers. This type of community scale trust fund set up at each POs can also be further be supplemented by local government development activities.

n) Support for value adding processing of some of products may add benefit to the farmers as well as several small-scale individual producers. For example, making candy out of ginger, sale of dry pumpkin seed, etc. For the CARLEP project more focus was on the input side but were given lesser priorities in the processing part except dairy part, so for future projects or continuing the support to the producers, there is a need to provide support on the processing part so that the agri-business activities get further intensified in areas.

o) Now with the assured market of milk to the KIL, there is demand for higher volume of milk where farmers are in need of continuous supply of fodder throughout the year. Hence, if the dairy production promotion is linked with other fodder development initiatives, or also with forest-based livelihood development activities, and with community forestry programme, then this will complement the cattle rearing activity of the project. In some places, barren community forestry land was leased to the poor households to grow improved fodders for their own needs as well as for market. This kind of mechanism may be promoted more in the upcoming project for getting complementary benefits of farm sector activity with animal rearing activity.

p) In an effort to create opportunities for youth in rural areas, the Government has developed the Land-use Certificate Programme (LUC), with the objective of offering land to youth to enhance productive use of land; encourage next generation farming through farm mechanization and large-scale production to promote enterprising farming; and to enhance rural economy. CARLEP has tested this LUC through supporting youth in investing on the land offered by the Government. However, several constrains were identified to negatively impact the progress of the activities planned. Drop-out rates in the LUC sites were

generally high, which is mainly due to remoteness of land, long distance to markets, lack of water availability and conflicts between the members. Owing to these, CARLEP's future investment decisions must be looked at from the prism of strategic land location, adequate farming facilities, interest of the youth and their co-investment capacity to ensure efficient resource allocation as well as long-term engagement and success.

q) The dairy value chain model linking producers to the Koufuko International Limited (KIL) dairy plant based in Trashigang has been a successful model in the region. KIL serves as an assured market for fresh milk produced by the dairy farmers in the eastern region. Moreover, the fruit value chain development, initially focusing on few crops such as pineapple and passion fruit, is also being processed by the Bhutan Agro-Industry plant in Lingmethang. Both those private initiatives have been supported by CARLEP, in an effort to further develop the value chain, ensure smallholder farmers enter into contract farming relationships with the private sector, and promote commercialization. However, this public financing support to the private sector should also include some Corporate Social Responsibility conditions that will shape those relations in the future and when CARLEP phases out, such as backward integration in terms of delivering technical support to farmers to enhance yield and quality, as well as providing shares in these plants to farmers could further boost production and the linkages.

r) There is need of some kind of built and operate principle for the facilities or inputs provided through the project to various farmers and groups for the long-term sustainability such as through proper mentoring and guidance specially for the youth groups so that even if someone drops, others will take up and continue the ventures.

s) In terms of procurement system, IFAD's requirements are different from those of RGoB, which creates problems during the process of procurement. It would be more efficient if these two systems can be synchronized for the future projects.

t) RGOB follows fiscal budget cycle from June to July while IFAD follows calendar year from January to December which is creating some problem for timely release of budgets. Thus, for efficiency and management of budgeting process, these two budgeting cycles need to be aligned and PMU must also need to understand the budget cycle to avoid some of the issues faced during budget requisition and timely release of budget.

u) Linkage of milk from the production to market have benefitted dairy farmers in terms of increasing their assured market and income. However, the problem is with regard to absence of proper cooling system to maintain a consistent cold chain to ensure milk quality and safety during transportation. Thus, there is a need of vehicle equipped with proper cooling system to transport the milk to designated processing units.

v) For those farmers and groups who are provided by equipment or machineries, they are not confident on the repair and maintenance including procurement of spare parts. Accordingly, there is a need to provide trainings on proper maintenance of equipment or machineries as well as from where to purchase spare parts for proper functioning and utilization.

w) With regards to cost sharing mechanism, there are different ratios some in 70:30 while on others 60:40. During the consultations, farmers questioned on different rules applied for different activities which is creating confusion. Accordingly, there is a need to create

awareness to the stakeholders on the cost sharing mechanism and also align the system based on actual field requirements.

11. Reference

a) Monitoring & Evaluation Guidance Note, Operational Policy and Results Division, IFAD, December 2022
b) Overview of IFAD guidance to strengthen project-level M&E, IFAD, July 2023
c) Theory of Change and Logical Framework – Guidance notes, Operational Policy and Results Division, December 2022
d) IFAD's Core Indicators Framework Operational Policy and Results Division, July 2023
e) Core Outcome Indicators Measurement Guidelines (COI), Operational Policy and Results, IFAD, October 2021
f) Baseline survey and Climate Vulnerability Assessment, CARLEP
g) Commercial Agriculture and Resilient Livelihoods Enhancement Programme, Final Project Design Report, CARLEP,2014
h) Programme implementation manual, CARLEP, 2016
i) Guidelines for project completion, 2016, IFAD
j) IFAD's core indicator framework, Operational policy and results division, July 2023
k) IFAD Core outcome indicator measurement guidelines, Operational policy and results division, October 2021
l) Guidelines for Project Completion Reports, IFAD
m) Commercial Agriculture and Resilient Livelihoods Enhancement Programme Supervision Report, Mission date 5 - 20 October 2023
n) Aide memoire, Commercial Agriculture & Resilient Livelihoods Enhancement Programme (CARLEP), 20 Oct to 10 Nov 2024
o) Gender Mainstreaming and Social Inclusion Strategy, Commercial agriculture and resilient livelihood enhancement programme (CARLEP), December 2016
p) Commercial Agriculture and Resilient Livelihoods Enhancement Programme, Annual Outcome Survey Report, 2023
q) Commercial Agriculture and Resilient Livelihoods Enhancement Programme, Annual Outcome Survey Report, 2019
r) Commercial Agriculture and Resilient Livelihoods Enhancement Programme, Annual Outcome Survey Report, 2018
s) Annual Progress Report, 2016-17, 2017-18,2018-19, 2019-20, 2020-21,2021-22, 2022-23, CARLEP
t) Rapid Impact Assessment Report (2020-2021), CARLEP

12. Annexures

12.1 Project Logical framework

Narrative summary	Key performance indicators	Means of Verification	Assumptions
Goal: Sustainably increase smallholder producers' incomes and reduce poverty through commercialization of production within programme households.	• 5000 direct beneficiary HH in vegetable and dairy value chains report at least 25% increase in HH asset and income, as compared to baseline (disaggregated by HHs-head gender) • 15% reduction in the prevalence of child malnutrition, as compared to baseline	• IFAD's Results and Impact Management System (RIMS) and baseline surveys • Programme M&E	• No major socio-economic slow down, or natural disasters • Increasing support for collaboration between different • Agencies, civil society and private sector to develop value chains • Continued MoAF support for innovative approaches • Agricultural approaches and technologies primarily remain profitable • Programme investments are Development Objective: realized as designed
Development Objective: Increased returns to smallholder farmers through climate resilient production of crops and livestock in nationally organized value chains and marketing systems.	• ≥ 30% increase in production of vegetables and dairy products • ≥ 20,000 HH in vulnerable areas with increased water availability for agriculture production	• Baseline survey • Sector studies • Technical agencies' reports and studies • Research and academic studies • Programme M&E	
Component 1: Market-led sustainable agricultural production			
Outcome 1: Community-based Resilient Agricultural Production has sustainably increased	• 6000 HH adopt sustainable agricultural practices • Of which 4500 direct beneficiary HH of the new vegetable groups, and 450 direct beneficiary HH of the new dairy groups have on average 15% increase in production	• Programme M&E reports • Contracted studies • RIMS and benchmark • Scientific and conference papers	• Collaboration between Government Agencies/staff and non-state service providers is successful • Royal Government of Bhutan (RGoB) complementary financing and supportive

			annual block grants (dzongkhags) is allocated and utilised
Output 1.1: Increased Production Resilience, Diversification and Innovation	≥ 23000 (of which 50% are women) smallholder HH supported in coping with the effects of climate change with sustainable land management practices	• Base line studies • Programme progress report • Line agencies' reports	RGoB earmarked funding (including other donors) of agricultural inputs and capacity development of farmer groups is allocated and utilised as per programme design Capacity of Government Agencies/staff and non-state service providers is adequate to achieve results as per programme design.
Output 1.2: Vegetable Production Intensified and Expanded	300 new vegetable farmer groups (4500 HH) established and functional; minimum 60% female members	• Base line studies • Programme progress report • Line agencies' reports	
Output 1.3: Dairy Production Intensified and Expanded	150 Smallholder Dairy Farmer Groups (450 HH) established and functional, with minimum 50% female members	• Base line studies • Programme progress report • Line agencies' reports	
Component 2: Value chain development and marketing			
Outcome 2: Increased smallholder income from Crop and Livestock Value Chains	70% of the agricultural enterprises established have a positive outlook on their profitability and sustainability	• Programme M&E reports • RIMS and benchmark • Line agencies' reports • Sector studies and reports • Farmer satisfaction surveys	As above under Component 1 Willingness for collaboration between Government Agencies/staff, FCBL and non-state actors, including small entrepreneurs and businesses, to develop and manage value chains and market infrastructure
Output 2.1: Resilient Vegetable and Dairy Value Chains developed	65 geogs have developed climate resilient vegetable and dairy production, marketing,	• Programme progress report • Sector reports and studies	FCBL has adequate financial allocations to develop its own

	and infrastructure management plans		capacity next to programme support Geogs are willing to develop more holistic (value chain based) geog plans for dairy and vegetables to guide Programme investments and strengthen local institutions for climate resilience
Output 2.2: Agricultural Commercialization and Enterprise Development strengthened	• 115 marketing groups established or revitalized and functional within programme value chains • 200 agriculture enterprises (including cooperatives) established and strengthened as part of value chain development	• Programme progress report • Sector reports and studies	As above Adequate number of interested and able entrepreneurs come forward to establish businesses Access to finance for small rural agricultural entrepreneurs is adequately facilitated
Output 2.3: Community-driven Strategic Market Infrastructure developed	Vegetable and dairy value chain processing and marketing infrastructure designed and constructed in 10 dzongkhags	• Programme progress report • Sector reports and studies	Complementary financing from RGoB and FCBL will be provided as earmarked
Component 3: Institutional Support and Policy Development			
Outcome 3: Strengthened Agricultural Institutions and Policies for Improved and Resilient Agricultural and Marketing Practices	≥ 70% of VC stakeholders report the use of market information in investment decision making 60% of VC stakeholders report satisfaction with the policy and regulatory framework as providing a fair distribution of incentives, costs, benefits, and risks.	• Programme M&E reports • Line agencies', Department of • Agriculture Marketing and Cooperatives (DAMC), FCBL and Business Opportunity and Information Centre (BOiC) reports	MoAF will pro-actively implement the 11th FYP strategy for enabling private sector engagement and participation within the process of commercialisation of agricultural development

		• Sector studies and reports • Programme survey	
Output 3.1: Strengthened value chain and marketing knowledge and communication	Market Information System MoAF/DAMC providing relevant (real-time) information to farmers	• Programme M&E reports • Line agencies', DAMC, FCBL and BOiC reports • Sector studies and reports	Adequate technical and process support is provided to develop the models and approaches on the ground, to access learning and to document good practice (presently a weak part of IFAD projects)
Output 3.2: Climate change resilience and value chain development lessons mainstreamed in agricultural policies and sector strategies	• Enhanced engineering norms for building climate resilient irrigation systems developed and approved • Vegetable and dairy development policies developed based on multi-stakeholder consultation processes and programme lessons (resilience, value chain and marketing) • Regulatory framework for private sector development and Public Private Partnership in agriculture sector developed	• Programme M&E reports • Line agencies' reports • Sector studies and reports • Policy documents • Regulatory framework document for private sector and PPP	Dialogue and collaboration between Government Agencies/staff and external stakeholders is successful and generates meaningful lessons and insights for policy development.

12.2 Progress as per project log-frame

	Name	Baseline	Mid-Term	End Target	2024 cumulative
Outreach	**1.b Estimated corresponding total number of households members**				
	Household members - Number of people		28,975	141,562	153,905
	1.a Corresponding number of households reached				
	Women-headed households - Households		2,254	14,486	16,015
	Non-women-headed households - Households		3,382	14,489	16,988
	Households - Households		5,636	28,975	33,003
	1 Persons receiving services promoted or supported by the project				
	Males - Males			55,000	51,115
	Females - Females		11,088	55,053	51,441
	Young - Young people		200	2,000	1,255
	Total number of persons receiving services - Number of people		11,088	110,053	102,566
Project Goal Sustainably increase smallholder producers' incomes and reduce poverty through commercialization of production within programme households	**5,000 direct beneficiary HH in vegetable and dairy value chains report at least 25% increase in HH asset and income, as compared to baseline (disaggregated by HHs-head gender)**				
	% of increase in HH asset and income - Percentage (%)		12	25	
	15% reduction in the prevalence of child malnutrition, as compared to baseline				
	% reduction child malnutrition - Percentage (%)	31.37		16.7	
Development Objective Increased returns to smallholder farmers through climate resilient production of crops and livestock in nationally organized value chains and marketing systems	**≥ 30% increase in production of vegetables and dairy products**				
	% increase in production - Percentage (%)		25	30	
	≥ 20,000 HH in vulnerable areas with increased water availability for agriculture production				
	Households - Number		2,276	20,000	
Outcome Community-based Resilient Agricultural Production has sustainably increased	**6,000 HH adopt sustainable agricultural practices**				
	Households - Number		5,636	6,000	692
	1.2.2 Households reporting adoption of new/improved inputs, technologies or practices				
	Total number of household members - Number of people			24,000	45,769
	Households - Households			6000	10,602
Output Increased Production	**≥ 23 000 (of which 50% are women) smallholder HH supported in coping with the effects of climate change with sustainable land management practices**				
	Females - Number		1,486	11,500	6,266

Resilience, Diversification and Innovation	Households - Number		3,665	23,000	10,444
Output Vegetable Production Intensified and Expanded	**300 new vegetable farmer groups (4 500 HH) established and functional; minimum 60% female members**				
	No. of groups formed - Number		34	300	152
	Policy 1 Policy-relevant knowledge products completed				
	Number - Knowledge Products				6
Output Dairy Production Intensified and Expanded	**150 Smallholder Dairy Farmer Groups (450 HH) established and functional, with minimum 50% female members**				
	No. of groups formed - Number		21	150	100
	Households receiving animals from distribution/restocking				
	Households - Number				
Outcome Increased smallholder income from Crop and Livestock Value Chains	**70% of the agricultural enterprises established have a positive outlook on their profitability and sustainability**				
	% of positive outlook on profitability - Percentage (%)		20	70	
	2.2.2 Supported rural enterprises reporting an increase in profit				
	Number of enterprises - Enterprises			140	151
	Percentage of enterprises - Percentage (%)				
Output Resilient Vegetable and Dairy Value Chains developed	**65 gewogs have developed climate resilient vegetable and dairy production, marketing, and infrastructure management plans**				
	No. of gewogs - Number		30	65	60
Output Agricultural Commercialization and Enterprise Development strengthened	**200 agriculture enterprises (including cooperatives) established and strengthened as part of value chain development**				
	No. of enterprises - Number		34	200	170
	Other productive infrastructure constructed/rehabilitated				
	No. of infrastructure - Number		743	1,000	581
	People in groups managing productive infrastructure				
	Males - Number			2,500	3227
	Females - Number			2,000	2491
	Groups managing productive infrastructure formed/strengthened				
	No. of groups formed - Number		15	30	64
	Crop/Livestock production groups formed/strengthened				
	No. of groups - Number			30	48
	People trained on land management practices				
	Males - Number			1,000	687
	Females - Number			1,000	556
	2.1.4 Supported rural producers that are members of a rural producers' organization				

	Total number of persons - Number of people			3,337	9187
	Males - Males			2250	5005
	Females - Females			2750	4182
	Young - Young people				
	Women in leadership position - Females				279
	1.1.4 Persons trained in production practices and/or technologies				
	Men trained in crop - Males			1,250	7139
	Women trained in crop - Females			781	7513
	Men trained in livestock - Males			1,100	4519
	Women trained in livestock - Females			653	4123
	Young people trained in livestock - young people				18
	Total persons trained in crop - Number of people			2,031	14652
	Total persons trained in livestock - Number of people			1,753	8642
	2.1.3 Rural producers' organizations supported				
	Total size of POs - Organizations			5,000	9187
	Rural POs supported - Organizations			200	329
	Males - Males			2,250	5005
	Females - Females			2,250	4182
	Young - Young people				
	2.1.6 Market, processing or storage facilities constructed or rehabilitated				
	Total number of facilities - Facilities			111	115
	Market facilities constructed/rehabilitated - Facilities			93	88
	Processing facilities constructed/rehabilitated - Facilities			6	13
	Storage facilities constructed/rehabilitated - Facilities			12	14
	1.1.2 Farmland under water-related infrastructure constructed/rehabilitated				
	Hectares of land - Area (ha)			1,922	1898
	3.1.4 Land brought under climate-resilient practices				
	Hectares of land - Area (ha)			3000	3242.71
Output Community-driven	**Vegetable and dairy value chain processing and marketing infrastructure designed and constructed in 10 dzongkhags**				

Strategic Market Infrastructure developed	No. of value chain processing and market infrastructure - Number		53		115
Outcome Strengthened Agricultural Institutions and Policies for Improved and Resilient Agricultural and Marketing Practices	**≥ 70% of VC stakeholders report the use of market information in investment decision-making 60% of VC stakeholders report satisfaction with the policy and regulatory framework as providing a fair distribution of incentives, costs, benefits, and risks**				
	% of stakeholders reporting use of market information - Percentage (%)	15	30	70	
	3.2.2 Households reporting adoption of environmentally sustainable and climate-resilient technologies and practices				
	Households - Percentage (%)		58		39.44
	Women-headed households - Households		1,260		572
	Households - Households		3,107	20,283	19,707
	3.2.3 Households reporting a significant reduction in the time spent for collecting water or fuel				
	Households - Households		1,700	8,693	2478
	Households - Percentage (%)		20	30	
	Women-headed households - Households				783
	1.2.3 Households reporting reduced water shortage vis-à-vis production needs				
	Households - Percentage (%)				
	Households - Households				2603
	Total number of household members - Number of people				10412
	Poor smallholder household members supported in coping with the effects of climate change				
	Females - Females			57,500	72763
	Males - Males			57,500	71475
	Total household members - Number of people			115,000	144238
	Households supported with increased water availability or efficiency				
	Households - Households			10,000	8916
	Individuals engaged in NRM and climate risk management activities				
	Males - Males			15,000	16988
	Total - Number of people			30,000	33003
	Females - Females			15,000	16015
	Community groups engaged in NRM and climate risk management activities				
	Groups - Groups			65	329
	Group members - females - Females			2,750	4182
	Group members - males - Males			2,250	5005
	Group members - total - Number of people			5,000	5743

Output Strengthened value chain and marketing knowledge and communication	**Market Information System MoAF/DAMC providing relevant (real-time) information to farmers**				
	No of market information system - Number			5	1
	2.1.2 Persons trained in income-generating activities or business management				
	Males - Males		486		4604
	Females - Females		324		4856
	Persons trained in IGAs or BM (total) - Number of people		810	9,671	9460
Output Climate change resilience and value chain development lessons mainstreamed in agricultural policies and sector strategies	**Enhanced engineering norms for building climate resilient irrigation systems**				
	No. of norms - Number			1	1
	Vegetable and dairy development policies enhanced based on multi-stakeholder consultation processes and programme lessons (resilience, value chain and marketing)				
	No. of policies - Number			1	1
	Regulatory framework for private sector development and PPP in agriculture sector developed				
	No. of framework - Number			1	1
	3.1.2 Persons provided with climate information services				
	Males - Males			2,500	694
	Females - Females			2,500	963
	Young - Young people				146
	Persons provided with climate information services - Number of people			5,000	1657
	1.1.3 Rural producers accessing production inputs and/or technological packages				
	Males - Males				16988
	Females - Females				16015
	Young - Young people				
	Total rural producers - Number of people				48186
	1.1.2 Farmland under water-related infrastructure constructed/rehabilitated				
	Hectares of land - Area (ha)			1,922	1733
	3.1.3 Persons accessing technologies that sequester carbon or reduce greenhouse gas emissions				
	Males - Males			2,500	1598
	Females - Females			2,500	2110
	Young - Young people				
	Total persons accessing technologies - Number of people			5,000	3708
	Government officials and staff trained				
	Males - Number			180	291
	Females - Number			80	61
	2.1.1 Rural enterprises accessing business development services				
	Rural enterprises - Enterprises			256	212

	Number of groups supported to sustainably manage natural resources and climate-related risks				
	Number of groups supported by crops sector - Number				118
	Number of groups supported by livestock sector - Number				138
	Natural resource manages groups with women in leadership positions - Number				
	Number of members of the project-supported enterprise				
	Males - Number				114
	Females - Number				176
	Young - Number				32
	Number of project-supported enterprise with women in leadership positions - Number				39
	Number of project-supported enterprise headed by young farmers - Number				29
	International and country dialogues on climate supported				
	Dialogues - Number			1	1
	Land under climate-resilient practices				
	Land area - Area (ha)			3000	3173.47

12.3 Performance of project as rated by supervisory missions

Status	2019	2020	2021	2022	2023	2024	Average
Financial management & execution	**4**	**4**	**4**	**4**	**3**	**3**	**3.67**
Quality of financial management	4	4	4	3	3	3	**3.5**
Acceptable disbursement rate	4	4	4	5	3	3	**3.83**
Counterpart funds	5	5	5	4	3	3	**4.17**
Compliance with loan covenants	4	4	4	4	3	3	**3.67**
Procurement	4	4	4	4	4	4	**4**
Quality and timeliness of audit	3	4	3	3	3	3	**3.17**
Project Management	**4**	**4**	**4**	**5**	**5**	**5**	**4.5**
Quality of project management	5	4	5	5	5	5	**4.83**
Performance of M&E	4	4	4	4	5	4	**4.17**
Coherence between AWPB & Implementation	4	3	4	4	5	5	**4.17**
Knowledge management	5	5	5	5	5	5	**5**
Value for money	5	4	4	4	5	5	**4.5**
Social, environment and climate standards requirements	4	4	4	5	5	5	**4.5**
Effectiveness and development focus	**4**	**4**	**4**	**5**	**5**	**5**	**4.5**

Effectiveness	4	4	4	5	5	5	**4.5**
Targeting and outreach	4	4	4	5	5	5	**4.5**
Gender equality and women's participation	4	4	4	5	5	5	**4.5**
Agricultural productivity	5	5	5	5	5	5	**5**
Nutrition	5	NA	5	5	5	5	**5**
Adaptation to climate change	4	4	4	5	5	5	**4.5**
Sustainability and scaling up	**4**	**4**	**4**	**5**	**5**	**5**	**4.5**
Institution and policy engagement	4	4	4	4	4	5	**4.17**
Partnership building	5	4	5	5	5	5	**4.83**
Human and social capital & empowerment	5	4	5	5	5	5	**4.83**
Quality of project target group engagement and feedback	4	4	4	5	5	5	**4.5**
Responsiveness of service providers	4	4	4	5	5	5	**4.5**
Environment and natural resource management	4	4	4	4	5	5	**4.33**
Exit strategy	4	4	4	5	5	5	**4.5**
Potential for scale up	4	4	4	5	5	5	**4.5**
Relevance	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Likelihood of achieving the development objective	4.31	4	4.17	4.93	4.96	5	**4.56**
Overall Implementation performance	4.17	4	4.31	4.17	3.92	4	**4.095**

12.4 Impact of the project-case studies

Young farmer anchors homeland with ambitious agribusiness venture

A 25-year-old Karma Wangdi in Berpa under Khoma Gewog in Lhuntse, redefined agriculture by venturing into integrated agribusiness. His aim is not just to be a commercial mushroom grower but to keep his ancestral land alive and productive. It was possible only because of the assistance provided through CARLEP along with the Dzongkhag Administration. After completing his class XII in 2018, he was not able to continue higher studies due to financial constraints. In 2022, he established Karmic Farm with the initial investment of Nu.100,000 from his mother with 500 shitake logs and 90 bags of oyster mushrooms which failed. Then he started learning techniques and lessons online along with inspiration and technical guidance from Samsara Agricultural Farm in Kalapang, a model farm in eastern Bhutan.

Today, Karmic Farm has over 1000 mushroom bags in operation and more than 400 bags showing signs of yield. With the support from CARLEP, he could build a shed with high-tech farming consisting of various necessary equipment under 70:30 cost sharing model. He also received training on mushroom cultivation and management. The first year was unsuccessful but at the later stages, he could earn Nu.51,000 to Nu.204,000. He supplies 20 to 50kg of mushroom under each order to 3 schools and 50 to 60kg to nearby dratshang. His farm is also connected with technology where he monitors and manages farm conditions via smart phone. He is keen on community led agricultural innovation in future.

Chain-link fencing and hybrid seed transforms rural community

In Rizoryerchilo Chiwog under Uzorong Gewog in Trashigang was once an endless struggle with limited access to quality seeds, recurring threats from wild animals and families growing for their own consumption. In 2023, with the support from CARLEP provided chain link fencing over 15 acres of farmland benefitting 49 households. In 2024, they have received 300kgs of hybrid seed from ARDC and now they call this as an economic blessing and farmers are now into commercial farming. Accordingly, they have harvested about 320kgs of hybrid seed whose quality has

impressed everyone. It has sparked community level seed production with the provision of training on agronomic practices from field layout to detasseling and pollination. Farmers are now expanding the seed production model with the technical support provided by the extension officers.

Dairy cooperative in Gomdar

Gomdar Om Nyamlay Tshogdey, a dairy cooperative is fast becoming a model of rural resilience and cooperation. It was established in 2012 with just 18 members which turned out to 147 members and 25 non-member suppliers from 5 Chiwogs. The milk collection center was built with support from Dzongkhag administration but the turning point was in 2016 when the nearly defunct cooperative was revived through assistance from CARLEP. With the support of Nu.2.7 million, new milk collection center was built along with solar power to operate the chillers. Farmers are provided Nu.35 per litre and supplies about 700 litres on alternate days to KIL for Nu. 40 per litre.

Solar has allowed farmers to store milk properly and ensure timely supply to KIL. Further to improve the quality of milk supply, Gewog have already purchased 45 jersey cows with support from the CARLEP. The CARLEP was also able to support construction of 10 cattle sheds and installed 300 biogas plants in the gewog. Now the Gewog has 200 cattle sheds, one milk processing unit and 20 milk collection centres. Milk remains one of the flagship products of gewog for One Gewog, One Product initiative.

Dryland Irrigation Benefits Wamakhar Farmer

Once gripped with water scarcity, the village of Warmakhar in Chali Gewog in Mongar is now a flourishing hub of commercial vegetable farming due to successful rural water supply from CARLEP. Earlier, village has a small contaminated pond inadequate for supply of water forcing people to depend on market supplies even for basic needs. With the support from CARLEP of Nu. 2.5 million, village constructed 30,000 water tank which serves 46 households for drinking, irrigation and household use. Now the results are visible in the green fields and rising incomes of about Nu.200,000 per season with growing of vegetables and possible to cultivate maize two times in a year. Almost every household now have power tillers and cars. Now they are able to supply their produce to Gyelsung academy in Lingmethang and other areas within the Dzongkhag.

Linking dairy farmers to Koufuco

Koufuko International Ltd. is a pioneering dairy plant established in 2013 at Trashigang under FDI joint venture between DHI and SNBL, Japan with shareholding of 30% and 70 % respectively, now under the DHI shareholding. The Dairy Plant came to an operation starting 2015 with collection of 400-500 liters milk every day from few dairy farmers' groups in Trashigang and processed Gouda cheese and yoghurts. Today, the Company produces processed cheese under the brand name "Druk Zambala Cheese", salted and non-salted butter, stirred yoghurt, set yoghurt, gouda cheese and cottage cheese.

As per the record maintained by KIL, the Company has collected 475,611.19 litres of milk from the dairy farmer groups in 2021. The KIL collects milk from 11 milk collection centres at Trashigang and Monggar using two milk transport tankers supported by CARLEP and a milk transport van owned by the Company. On an average, the smallholder dairy farmers have supplied 52,845.68 litres of milk monthly to KIL with milk payment of Nu. 1.90 million to smallholder dairy farmers belonging to 21 Dairy Groups. The company pays Nu. 35 per litre milk to those delivering to milk collection centres and Nu.33 per litre to those farmers when the milk is being collected by the company from numerous collection points.

Development and constant improvement of milk collection logistics was facilitated since 2016 with fund support from CARLEP. Hygienic dairy sheds, construction of milk collection sheds, construction of milk chilling centres, supply of milking buckets and milk cans, supply of deep freezers, milk analyzer, digital weighing balance, milk tankers, and training of farmers on clean milk production are some of the major interventions geared towards milk quality enhancement and building an overall resilient dairy value chain in the East.

With expansion of linkages between the Processor and the dairy farmer groups, milk quality aspects are taken on board and constant quality improvement strategies are put in place through development of appropriate legislation and self-regulation of dairy sub-sector.

Empowered Woman Runs a Successful Agriculture Venture

Karma Choki, 26 years old is a high school graduate who came back to her village, Khoyar–Gomdar in Samdrup Jongkhar amid the gloom and insecurity brought about by the COVID-19 while she was pursuing a hotel management course. In June 2020, she started Organic Farming along with her husband on two acres of land. However, she could not make much progress in farming as anticipated due to lack of technical knowledge and inputs. Later, Karma was identified by one of the Lead Farmers from Gomdar during the Farmer-to-Farmer Extension Program and got associated with the Samdrup Jongkhar Initiative (SJI) office.

Since then, she has attended several training sessions on organic farming practices including integrated model farm development with focus on vegetable production. She received support for water storage tank and HDPE pipe to mitigate water shortage, green net for fencing, CGI sheet for compost shed, farming tools and vegetable seeds to develop her farm with financial support from the CARLEP in 2020-2021. Now, she is one of the Progressive Farmers. In less than a year, she has produced and sold the vegetables, cereals and cash crop in the local market of Naphung and Samdrup Jongkhar worth about Nu.77,400.

Given her educational background, she often explores new farming techniques and methods from YouTube and experiments on her farm. She shares her knowledge and trains other fellow farmers when needed. She has trained more than 10 farmers on preparing bio-pesticides, soil nutrient management, preparing farm yard manure and vegetable cultivation using plastic mulching. She has also conducted farmer-to-farmer extension training programs to five farmers with support from CARLEP and Gewog Agriculture Extension officer.

"I never thought I would become so passionate about farming. I was always told farming is not profitable and it is work intensive. But the fact is, we just need to get used to it. Now I have decided to spend the rest of my life in the village. For that, I have started building a new house with all the income I am getting from selling farm produce. Currently, she is becoming a source of inspiration for many other younger generations in the community. Her farm is providing a learning platform for many people. She is also planning to extend her farm to increase the production by next year.

First Woman CAIT in Eastern Bhutan

Tashi Dema, 22, a young woman from Thridangbi under Saling gewog, Mongar is the first woman to take up the role of CAIT in eastern Bhutan under CARLEP. Tashi could not continue her studies after 7th grade and spent most of her time helping her parents with agribusiness. Dairy has been one of the important sources of nutrition and income for Tashi's family. With the home processing business, managing a dairy farm was tedious and challenging. Likewise, taking a cow to a breeding bull in nearby villages was time-consuming and laborious. Despite the presence of an AI Technician in the gewog, receiving timely AI services was challenging due to the lack of adequate AI technicians. Therefore, she decided to become CAIT and registered herself for the CAIT training. Despite being the first and only woman participating in the training, she worked hard and completed the training. She feels the training was very educative but also intense as the course was done with no prior experience in AI. She added that one does not need to have all the skills to start something, one should have a willingness to learn and explore.

At the age of 19, Tashi became a Community Artificial Insemination Technician. She completed Community AI Technician training in 2019 through the Regional Livestock Development Center, Kanglung. After completing the AI training, Tashi has proactively delivered AI service to the dairy farmers from the village, i.e., Thridangbee, Kalapang, and Saling. With her efficient and timely services, farmers in her gewog have been immensely benefited in terms of improving the breeds and reaching AI and animal health services.

Within Tashi's first year as a CAIT, she had inseminated 46 cows, out of which, more than 10 have given birth to fairly balanced gender of AI offspring. Currently, she earns an average income of Nu. 3500 a month from her services to farmers. As more farmers are coming forward to avail AI services, she aspires to expand her reach to more villages. Today, Tashi is one of the successful community AI Technicians despite the challenges she faced as a woman. She has demonstrated that women can be as effective and efficient as men in delivering AI services.

Pemathang Dairy Farmers Produces Fodder Using Hydroponic to Meet the Fodder Demand

The Samdrup Jongkhar Dzongkhag Livestock Sector (DLS) has initiated the development of an on-farm low-cost hydroponic fodder unit with locally available materials in 2017 with fund support from CARLEP. The hydroponic fodder unit was easily adopted by 16 dairy farmers from Pemathang Gewog as it utilizes very little space and water to produce large quantities of green fodder among other benefits.

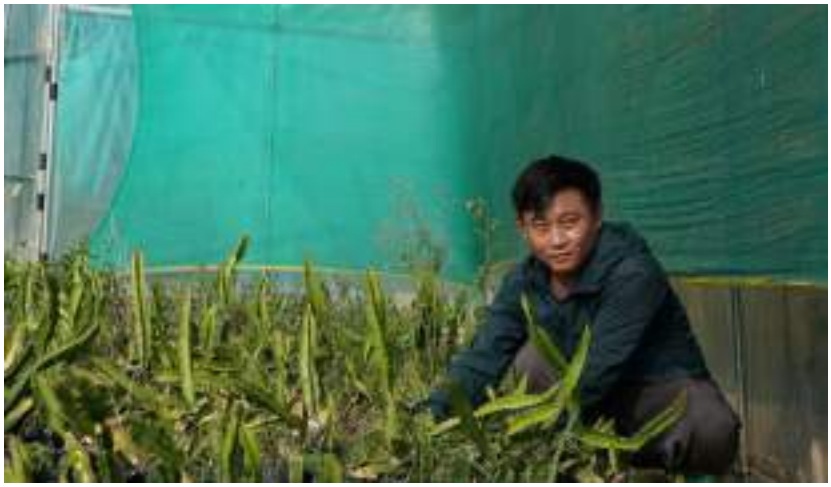
"Our cows used to appear gaunt or unhealthy due to the lack of green fodder but today, thanks to hydroponic fodder, our cows are healthier", says a 45 years old farmer, Pema Wangdi. Like Pema, Yangzom feels that she has been also blessed with the technology to meet the fodder demand of her cattle. "In the light of COVID 19 pandemic, collecting fodder from other places has become very challenging. In such a situation, hydroponic fodder technology came as a saviour for my gestating cow. I was able to feed my gestating cow with enough green fodder which has helped the cow in delivering healthy offspring," says Yangzom.

The hydroponic unit in Pemathang gewog serves as a model unit for hydroponic fodder production technology. Today, dairy farmers from the regions visit the sites to explore and learn on the technology. Most of the farmers are already showing interest in taking up the technology to address the fodder shortage. About 5 farmers have already approached the gewog livestock office to seek support on hydroponic fodder installation in the next financial year.

Unemployed graduate to successful nursery owner

Mr. Tshering Dorji, a 33-year-old Bachelors of Commerce graduate from Rangjung Trashigang, Bhutan, has experienced the challenges of unemployment. After brief stints in the private sector and participating in an "earn and learn" program in Japan, Tshering found himself back home with his dreams temporarily deferred. "I was a young man with a degree, yet I couldn't contribute to the

household income," he recalls. "It was a difficult period." However, Tshering's journey took a positive turn when he learned about the CARLEP matching grant program through ARDC-Wengkhar. His long-held passion for agriculture was reignited. With the guidance of ARDC, he developed a proposal, leading to the establishment of Paksam Horticulture Nursery in 2021. The CARLEP program transformed Tshering, covering half of his initial investment through the Matching Grant Scheme, which enabled him to acquire essential nursery equipment and materials. This crucial support, along with technical assistance from ARDC, empowered him to start his nursery successfully.



Today, Tshering's nursery is thriving. He cultivates a wide variety of fruit tree seedlings, ranging from popular avocados and peaches to exotic kiwis and dragon fruits. The guaranteed market is a significant advantage, with local entities such as the district agriculture office, ARDC Wengkhar, the National Seed Centre, and farmers across the eastern region eagerly purchasing his high-quality seedlings. Until now, Tshering's income from the sales of the fruit seedlings has been remarkable: he has sold a total of 6,650 seedlings of avocado, kiwifruit, pear, peach and citruses worth Nu. 0.994 million. It was made possible from his collaboration with CARLEP's Fruit Intensification Program and the Million Fruit Tree Project.

He envisions transforming Paksam Horticulture Nursery into a "mega project," creating employment opportunities for other young people facing similar challenges. Tshering's story highlights the impact of the CARLEP program. By supporting young agricultural entrepreneurs, CARLEP is not only nurturing a love for the land but also fostering a brighter future for Bhutan, one seedling and one empowered youth at a time.

12.5 Facility and infrastructure established by project

		Dairy value chain	Vegetable value chain
Trashigang	Yangner	FG, MPU	FG, potato storing shed, farm shop
	Bartsham	MCC	FG
	Bidung	FG, MCC	FG, potato storing shed, one stop farmers shop, farm shop
	Phongme	FG, MCC	FG, one stop farmers shop, farm shop
	Radhi	FG, MCC, Feed mill	FG, potato storing shed
	Shongphu	FG, MCC, Feed mill	FG, potato storing shed, local town
	Samkhar	FG, MCC, MPU, Feed mill	FG, local town, potato storing shed, one stop farmer's shop, vegetable market
	Kanglung	FG, MCC, Feed mill	FG, potato storing shed, vegetable market, local town
	Uzorong	FG, MCC	FG, potato storing shed, farm shop
	Khaling	FG, MCC	FG, potato storing shed, Agri processing unit,
	Lumang	MCC, Feed mill	FG, potato storing shed, one stop farmer's shop, vegetable market, sale counter, local town
	Thrimshing	MCC, MPU	FG, potato storing shed
	Merak	FG, MCC	
	Sakten	FG, GPP	Farm shop
	Kangpara		FG, farm shop
S/Jongkhar	Orong	FG, MPU	FG, farm shop
	Gomdar	FG, MPU	FG
	Wangphu		FG, farm shop
	Dewathang	Meat shop, FG, MPU, MCC	Cold storage, RNR market shed, sale counter
	Phuntshothang	Meat shop	FG, RNR market shed, vegetable collection shed, farm shop
	Pemathang	MCC	FG, vegetable collection shed
	Martshala	FG, MPU	FG, vegetable collection shed
	Samrang		
	Serthig		FG, farm shop
	Lauri	MPU	FG, vegetable collection shed

	Langchenphu	FG, Meat shop	FG, vegetable collection shed, RNR market shed, farm shop
T/yangtse	Bumdeling		FG, Farm shop, Potato store
	T/yangte	MPU, DG	FG, Farm shop, Potato store
	Toetsho	DG	FG, potato store
	Yalang		FG, Farm shop, Potato store
	Khamdang	DG	FG, Farm shop, sales counter, collection shed
	Tomzhangtshen		FG, sales counter, Potato store
	Jamkhar	DG	FG, Farm shop, collection shed
	Ramjar	DG	FG, Farm shop
P/gatshel	Shumar	FG, MPU	VFG, Cooling chamber, Agri processing unit
	Nanong		VFG, Agri processing unit
	Zobel	FG, PMU	VFG, Sale counter, Collection shed
	Chongshing	FG, MCC	VFG, farm shop
	Khar	FG, MPU	Farm shop
	Yurung	FG, MPU	Sales counter, farm shop
	Chhimung	MCC	VFG, Farm shop, market shed
	Dungmin		VFG, Farm shop
	Dechenling	FG, MPU	Sale counter
	Norbugang	FG, MPU, Feed mill	Farm shop, market shed
Mongar	Shermung	FG, MPU	FG, farm shop
	Balam	FG	
	Drametse	FG, MCC	FG, collection shed
	Chhaskhar	FG, MPU	FG, sale counter
	Ngatshang	FG, MCC, MPU, Meat shop	FG, farm shop
	Tshakaling		FG
	Thangrong		Farm shop
	Chhali		FG, sale counter
	Mongar	FG, MCC, MPU, meat shop	FG, market shed, farm shop
	Drepong	MCC	FG, potato store, farm shop
	Tsamang	FG, MCC, MPU	FG, farm shop
	Saleng	FG, MCC, MPU, Meat shop	FG, sale counter, market shed
	Silambi		Sale counter
	Gongdue		Farm shop
	Jurney		

	Kengkhar	MCC	
Lhuntse	Kutoe	MCC	FG, collection store, OSFS
	Khoma	FG	FG, potato store, farm shop, collection store, institutions linked with FGs
	Minjay	MCC, FG	FG, institutions linked with FGs
	Tshenkhar	Meat shop	FG, OSFS, collection store
	Jaray		FG, OSFS, collection store
	Metsho	MCC, FG	FG, farm shop
	Menbi		FG, OSFS, institutions linked with FGs
	Gangzur	Meat shop, Sale counter	FG, collection store, farm shop, institutions linked with FGs

12.6 EFA through Cost Benefit Analysis

Cost-benefit analysis method was used for carrying out the EFA. Project benefits include potential return from various project interventions such as increase in production and sale of vegetables and dairy products, livestock (dairy and poultry) and other interventions such as easy access to market, input supplies, reduction of drudgery due to various technology introduction, utilization of barren land, enhancement of food and nutrition including employment generation. The project cost which is the actual project expenditure as of financial year 2023-24 is taken into consideration. The benefits (both direct and indirect benefits) are estimated for all categories. Major sources of quantifiable benefits are the incremental vegetable and diary production through adoption of improved technology, management practices and access to financial services through cost sharing mechanism adopted by the project for strengthening of farmer's groups and cooperatives. These benefits are properly accounted. Farmers also benefit indirectly through improved agricultural production environment such as improved irrigation facilities, access to input supply, and market linkages. These benefits had been captured through indicative model for livelihood improvement, enterprise and production models, etc. that are focused on input marketing, product aggregation, processing, packaging, storage and distribution. Further, the project implementation approach to increase sustainability, resilience and profitability as a result of adaptation and mitigation technologies and practices, improved access to markets, access to basic and productive and market infrastructure, and financial education and business literacy are assumed to reduce price and quantity risks of the producers and are captured through integrated pricing mechanism.

Costs and Benefits (in million Nu.)											
	Cost		**Benefit**								
Year	Investment	Input supplies	Veg. production	Dairy production	Agriculture land use	Access to input supplies	Easy market access	Nutrition enhanced	Drudgery reduction	Employment generation	Net Benefits
2015-2016	1,787.12		0	0	0	0	0	0	0	0	-1787
2016-2017	700.25	5.25	0	0	0	0	0	0	0	0	-706
2017-2018	508.58	5.51	250.00	360.00	0	0	0	0	0	0	96
2018-2019	1,106.51	5.79	262.50	378.00	0	0	0	0	0	0	-472
2019-2020	1,310.08	6.08	275.63	396.90	5.30	27.50	22.70	0	0	0	-588
2020-2021	1,796.06	6.38	289.41	416.75	5.41	28.05	23.15	20.88	19.50	240.00	-759
2021-2022	1,152.90	6.70	303.88	437.58	5.51	28.61	23.62	21.30	19.89	252.00	-67
2022-2023	2,703.78	7.04	319.07	459.46	5.62	29.18	24.09	21.72	20.29	264.60	-1567
2023-2024	340.80	7.39	335.02	482.43	5.74	29.77	24.57	22.16	20.69	277.83	850
2024-2025	0	7.76	351.78	506.56	5.85	30.36	25.06	22.60	21.11	291.72	1247
2025-2026	0	8.14	369.36	531.88	5.97	30.97	25.56	23.05	21.53	306.31	1306
2026-2027	0	8.55	387.83	558.48	6.09	31.59	26.08	23.51	21.96	321.62	1369
2027-2028	0	8.98	407.22	586.40	6.21	32.22	26.60	23.98	22.40	337.70	1434
2028-2029	0	9.43	427.58	615.72	6.33	32.87	27.13	24.46	22.85	354.59	1502
2029-2030	0	9.90	448.96	646.51	6.46	33.52	27.67	24.95	23.30	372.32	1574
2030-2031	0	10.39	471.41	678.83	6.59	34.19	28.22	25.45	23.77	390.93	1649
2031-2032	0	10.91	494.98	712.78	6.72	34.88	28.79	25.96	24.25	410.48	1728
2032-2033	0	11.46	519.73	748.41	6.86	35.57	29.36	26.48	24.73	431.01	1811
2033-2034	0	12.03	545.72	785.83	6.99	36.29	29.95	27.01	25.23	452.56	1898
2034-2035	0	12.63	573.00	825.13	7.13	37.01	30.55	27.55	25.73	475.18	1989
2035-2036	0	13.27	601.65	866.38	7.28	37.75	31.16	28.10	26.24	498.94	2084
2036-2037	0	13.93	631.74	909.70	7.42	38.51	31.79	28.66	26.77	523.89	2185
2037-2038	0	14.63	663.32	955.19	7.57	39.28	32.42	29.24	27.30	550.08	2290
2038-2039	0	15.36	696.49	1002.95	7.72	40.06	33.07	29.82	27.85	577.59	2400
2039-2040	0	16.13	731.32	1053.09	7.88	40.86	33.73	30.42	28.41	606.47	2516
										IRR	**13.12%**
										NPV	**3198.99**

12.7 Crop profitability returns

The crop profitability results were calculated to selected crops to understand its farm and enterprise economics. The table below shows the "without project" and "with project" net incomes and labour return, with project production systems incorporating good seed, fertilizer and other input supplies.

Crop profitability returns

	Without project		With project	
Crop	Net return per acre (Nu.)	Return per HH per day (Nu.)	Net return per acre (Nu.)	Return per HH per day (Nu.)
Paddy	14886	305	24575	528
Maize	18679	458	26718	574
Cabbage	18679	458	42358	595
Broccoli	14886	305	33303	1010
Beans	14886	305	32299	528
Chilli	18679	458	66401	863
Cauliflower	18679	458	47641	607
Ginger	22330	488	46634	628
Potatoes	44297	568	59779	996
Mandarin	66446	852	89485	663

12.8 Terms of Reference for PCR

Background

This document provides Terms of Reference (ToR) for carrying out End Line Survey and preparation of Programme Completion Report (PCR) for Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) which covers six districts- Lhuentse, Mongar, Pemagatshel, Samdrup Jongkhar, Trashigang and Trashiyangtse. The project was initially designed for seven years from 2016 until 2022 but with the approval of additional financing the project has been extended by three years and will be completed in end of 2025, making it a 10-year project. CARLEP's core objective is to transform Bhutan's subsistence-based rural agricultural economy into a sustainable, market-driven sector through climate-smart agricultural approaches, private sector engagement in agricultural commercialization, and strengthened community and local institutional capacities. The goal and objective is to sustainably increase smallholder farmers' incomes and reduce rural poverty. This will be achieved through climate resilient commercialized production of crops and livestock by programme households linked to nationally organized value chains and marketing systems. The Programme initially targeted selected gewogs in six eastern Dzongkhags with high production and marketing potential in the selected value chains expected to benefit 28,975 smallholder households, of which 7115 households will directly benefit from vegetable and dairy value chains. However, the coverage was not only confined to the selected gewogs but went beyond it, and in fact almost all the gewogs in eastern Bhutan were literally covered by the project.

The Programme consists of four key components[1]: i) market-led sustainable agricultural production with three main outputs such as increased production resilience, diversification and innovation; intensification and expansion of vegetable production (amended as intensification, expansion and establishment of nutritious high value commodities after approval of additional financing); and intensification and expansion of dairy production; ii) Value chain development and marketing with three main outputs such as resilient vegetable and dairy value chains developed; agriculture commercialization and enterprise development strengthened; and development of community-driven market infrastructures; iii) Institutional support and policy development; and iv) Programme management.

Before the project implementation, a baseline survey[2] and climate vulnerability assessment was conducted in six program districts (Lhuentse, Mongar, Pemagatshel, Samdrup Jongkhar, Trashigang and Trashiyangtse) as treatment group with sample size of 556 households and four districts (Sarpang, Tsirang, Zhemgang and Chukha) as control group with a sample size of 214 households, considering that the latter districts having initially planned to be supported by CARLEP in its second phase was withdrawn.

Objectives of the end line survey and preparation of PCR

The primary objective of this assignment is to conduct an end line survey and preparation of PCR to achieve the outputs as follows:

a) Compare and analyze outcomes and impacts against targets
b) Capture key challenges, lessons learned and key recommendations
c) Outline post-programme sustainability strategies
d) Evaluation and documentation of project performance, experiences and innovations that will serve as valuable knowledge resources for future programming.

In overall, the end line survey and project completion report will assess the extent of progress towards achieving the Programme's planned targets, identify any issues or challenges faced and offer recommendations for other Programmes if necessary.

Scope of the consultancy services

Survey design and planning

The consultancy firm or the consultant is responsible for:

a) Reviewing the baseline survey report and project log frame indicators thoroughly to inform the end-line survey design and planning.
b) Based on the review of documents, the consultant will produce a detailed inception report outlining the methodology, sampling techniques, questionnaire sets, data analysis tools and survey plan.
c) Develop questionnaires for household survey and check list, and tools for group interaction including focus group discussion and key informant's interview, in relation to the CARLEP

[1] Please refer to final project design report for detailed review of components and outputs
[2] Please refer to CARLEP baseline survey report for review

log frame indicators[3] with expected metrics. Follow IFAD core indicator frameworks[4] and IFAD core outcome indicator measurement guidelines[5].

d) For the purpose of PCR preparation, the consultant will holistically review CARLEP M&E documents in close consultation with Office of the Programme Management, besides the findings of the end line survey. Where ever the baseline data are not available, secondary sources and participatory evaluative methodologies should be used to supplement or validate the findings of the survey.

Field data collection

Key components under this section will include, but not limited, to the following:

a) Recruit and train enumerators on the survey tools and data collection protocols. Carry out pre-testing of the questionnaire and finalize the questionnaire in consultation with the OPM.
b) Prepare field data collection schedule for enumerators.
c) Carry out household and community surveys, ensuring accurate geo-coordinates for all surveyed households and communities. Implement the quantitative survey using the most appropriate computer adaptive personal Interviewing techniques with hand-held tablets or mobile phones. Qualitative data can be obtained by conducting key informant interviews (KII) and focused group discussions (FGD), aligning to the CARLEP indicators (Log frame indicators).
d) Secondary sources and participatory evaluative methodologies should be used if baseline data are not available.

Data analysis and reporting

a) Conduct data cleaning and validation for analysis
b) Employ both quantitative and qualitative survey tools and instruments referring to the baseline study design.
c) Prepare a comprehensive end line survey report emphasizing on measuring end line indicators[3] for CARLEP project to determine: demographic characteristics, household assets and income, housing and facilities, food security, reduction in child malnutrition as compared to the baseline, % increase in vegetable (including fruits and cereals) and dairy production, adoption of sustainable agricultural practices, profitability of agricultural enterprise, reduction in time spent for collecting water and fuel, and households reporting reduced water shortages vis-à-vis production needs, adaptation to climate change, including findings, conclusions and recommendations.
d) Based on the desk review of M&E data and the findings of the survey, the consultant will prepare PCR that aligns to the IFAD Guidelines for Project Completion[6]

[3] Please refer CARLEP revised log frame
[4] IFAD Core Indicators framework
[5] IFAD core outcome indicators measurement guidelines
[6] Please refer IFAD Guidelines for Project Completion

Key output variables

This end-Line Survey is expected to evaluate various impact indicators. Specifically, the Consultant will assess, but not limited to:

a) **Impact on Poverty Reduction:** The Programme's effect on reducing poverty among households in the CARLEP area.
b) **Food Security and Nutrition:** Changes in daily food habits, food security periods, and nutritional status of beneficiary households, including the prevalence of malnutrition. This also entails including the analyses of seasonality; also using Household Food Insecurity Access Scale (HFIAS).
c) **Value Chain Specific Indicators:** Assessment of various aspects such as cost efficiency, quality control, supply chain effectiveness, and customer satisfaction at each stage of the process. Analysis of which Value Chains were more inclusive/ exclusive.
d) **Service and Product Transactions:** The level of service and product transactions between Producer Organizations (POs) and private entities (buyers, service providers).
e) **Market Infrastructure Access:** Access to market infrastructure, aggregation/collection centers and cold storage, and satisfaction with these improvements.
f) **Improved Market Practices:** Market linkages, collective marketing, increased bargaining power, pricing mechanism and incremental value.
g) **Technology Adoption and Inputs:** Adoption of technology and use of cash inputs (fertilizers, pesticides, etc.), along with environmentally sustainable and climate resilient practices.
h) **Crop and Livestock Yields:** Changes in crop and livestock yields and associated revenue.
i) **Gender Equality and Women's Empowerment:** changes in gender roles and relations and the changes in women's status including analysis of three dimensions; economic empowerment to enable both rural women and men to participate in and benefit from profitable economic activities; (2) both women and men have equal voice and influence in rural institutions and organizations, including decision-making processes at household, community or local level; (3) more equitable balance in workloads and in the sharing of economic and social benefits between women and men with disaggregated data by sex, while also calculating and analyzing Women Empowerment in Agriculture Index (WEAI).
j) **Households Income:** Total income of HHs including on-farm and off-farm including from the specified value chains supported as well as remittance.
k) **Drudgery reduction:** Contribution to drudgery reduction through mechanization and relevant tools /technologies support and time savings including productive use of saved time for socio-economic activities.
l) **Climate Change Adaptation:** The contribution of the programme towards making adjustments and implementing strategies to reduce the negative impacts of climate change and to take advantage of any potential benefits.
m) **Environment and Natural Resource Management:** Implementation of practices and policies to protect biodiversity, manage land and water resources, and mitigate environmental impacts, aiming to balance human needs with ecological health and sustainability.

Reports

Based on the assessments through end line survey and review of project M&E documents, the Consultant will produce two separate reports:

a) End line survey report, and
b) Project Completion Report (Please refer IFAD PCR Template[6])

Deliverables and tentative timeline

Sl. No.	Deliverables	Timeline	Estimated No. of days
1	Implementation of end line survey including training of enumerators	March 10, 2025	35 days
2	Data cleaning, analysis and report writing, including preparation of project completion report	April 11, 2025	30 days
3	Submission of draft end line survey report and PCR	April 18, 2025	15 days
4	Submission of final reports (End line survey report and PCR), both hard copy and electronic version, after incorporating feedback and also the consultant to provide survey data in appropriate format (Microsoft Excel, Microsoft Word, CSV, etc.)	April 25, 2025	10 days
	Total estimated days		**90 days**

Qualification and experience of the consultancy firm

The firm should have the following key personnel with qualification as detailed below:

a) **Team Leader**: The Team Leader will oversee the planning, implementation, and reporting of the End-Line Survey (ELS) and Programme Completion Report (PCR), ensuring adherence to the highest professional standards. The individual will be responsible for effective quality control, supervising the data collection team, and ensuring that each team member fulfills their specific responsibilities. A Team Leader with minimum of Master's degree in any field with at least 5 years of relevant field experience is required and must posses proven technical skills in conducting baseline, midline, and impact surveys in the agricultural sector and statistical expertise to analyze data and interpret results.
b) **Financial analyst**: The Financial Analyst will have a strong background in rural finance, economic development, and research methodologies. This role involves conducting in-depth research, analyzing financial systems and their impact on rural communities. Rural finance expert with a minimum of Master's degree in economics, finance or development studies with strong analytical and research abilities and sound proficiency in statistical software and data visualization tools with a minimum of 5 years' experience is preferable for the assignment.

c) **Livestock or agriculture expert**: Minimum of bachelors' degree in agriculture or livestock field with a minimum of 5 years' experience in data analysis and report writing related to agriculture or livestock operations.
d) **Infrastructure expert**: The Infrastructure Expert must possess at least a Master's degree in Civil Engineering, Infrastructure Development, Urban Planning, or a related field, along with a minimum of 5 years of relevant experience. The Expert should have a strong background in infrastructure planning, design, implementation, and management, with proven experience in development projects, preferably in the context of rural or community infrastructure.
e) **Survey enumerators**: Enumerators will be responsible for conducting both quantitative and qualitative interviews to collect data. This role requires interacting with various stakeholders in the field, ensuring accurate data collection, and maintaining high data integrity standards. The Enumerators must have education qualification of at least diploma/degree in agriculture, livestock, forestry, sustainable development and must be fluent in local languages spoken in the Programme areas (eastern Bhutan).
f) **Gender and social inclusion expert:** The GESI Expert will hold a Master's degree (or equivalent) in Social Sciences, Gender Studies, GESI studies, and will have 5 years of experience in gender integration and women's empowerment, preferably within agricultural sector programs. The Expert will lead and provide technical direction for the gender and social inclusion components of the survey.

Payment terms

a) 10% of the Contract Price shall be paid on the Effective Date against the submission of a demand guarantee for the same.
b) 30% of the contract amount after submission and acceptance of the inception report
c) 30% of the contract amount upon submission of first draft study report
d) 30 % of the contract amount after submission of final report and acceptance by the Employer

12.9 List of Officials consulted

Sl.No	Name	Location	Agency	Designation
1	Karma Tshering	Tashi Yangtse	Dzongkhag Admin	Dasho Dzongda
2	Phurpa Tshering	Tashi Yangtse		DLO
3	Kinga Dechen	Tashigang		ADLO
4	Sonam Rinchen	Tashi Yangtse	Gewog Admin	Mangmi
5	Karma Wangchuk	Khamdang	Gewog Admin	Tshogpa
6	Phurpa Gyeltshen	Ramjar	Gewog Admin	Gup
7	Sonam Tenzin	Merak	Gewog Admin	Adm
8	Yenten Phuentsho	Radhi	Gewog Admin	Gup

9	Jamyang	Samkhar	Gewog Admin	Gup
10	Kinzang Nima	Bartsham	Gewog Admin	Gup
11	Sonam Dorji	Khaling	Gewog Admin	Gup
12	Kinzang Dorji	Kanglung	Gewog Admin	Gup
13	Karma Tenzin	Mongar	Dzongkhag Admin	DAO
14	Tenzin Wangchuk	Mongar Gewog	Gewog Admin	Gup
15	Sangay Zangmo	Drepong	Gewog Admin	Mangmi
16	Tenzin	Chaskhar	Gewog Admin	Gup
17	Tshewang Lhuendup	Narang, Khalong	Gewog Admin	Tshogpa
18	Tenzin Jamtsho	Lhuentse, Jaray	Gewog Admin	Mangmi
19	Mr. Cheki Dorji	Langchenphu	Gewog Admin	Livestock officer
20	Mr. Pema Lekso	Pemathang	Gewog Admin	Gup
21	Mr. Tshering Wangchuk	Pemathang	Gewog Admin	Agriculture
22	Mr.Jamyang Gyeltshen	Phuntshothang	Gewog Admin	Gup
23	Mrs.Tenzin Dema	Phuntshothang	Gewog Admin	Agriculture
24	Mr.Pema Gyelpo	Orong	Gewog Admin	Gup
25	Mr.Thinley Rabten	Pemagatshel	Dzongkhag Admin	Chief DLO
26	Dr ChiMi JaMthso	Trashigang	DVH	Management
27	Dechen ChezoM	Trashigang	DVH	Management
28	Dr Narayan Pokhrel	Mongar	DVH	Management
29	Karma Yangki	Mongar	DVH	Management
30	Karma Choki	Mongar	DVH	Management
31	Sangay Tshering	Pemagatshel	DVH	Management
32	Dr Sonam Choden	Trashiyangtse	DVH	Management
33	Karma Wangmo	Lhuentse	DVH	Management
34	Dr Sangay Letho	RLDC	RLDC	Management
35	Thrinang Wangdi	RLDC	RLDC	Management
36	Namgay	RLDC	RLDC	Management
37	Samdrup Zangmo	RLDC	RLDC	Management
38	Thukten	RLDC	RLDC	Management
39	Nanda kala	RLDC	RLDC	Management
40	Dawa Penjor	RLDC	RLDC	Management
41	Tsherwang Jamtsho	RLDC	RLDC	Management
42	Pema Yuden	RLDC	RLDC	Management
43	Wangchuk Namgay	RPPBC	RPPBC	Management
44	Kelzang Wangdi	Samdrup Jongkhar	DVH, S/Jongkhar	Management
45	Karma Choki	Mongar	DVH, Mongar	Management
46	Karma Zangmo	Pemagatshel	DVH, P/gatshel	Management
47	Kelzang Wangdi	Samdrup Jongkhar	DVH, S/Jongkhar	Management

48	Dechen Chenzom	Trashigang	DVH, Trashigang	Management
49	Mr. Tshering Penjor	Mongar	RAMCO	Asst. Marketing Officer
50	Mr. Norbu	Wengkhar, Mongar	PMU, CARLEP	Component Manager
51	Mr. Domang	Mongar	RNR-RDC	Program Director
52	Mr. Norbu Tshering	Mongar	Dzongkhag Admin	ADLO
53	Mrs. Kinga Wangmo	Thimphu	Cluster Finance	DCFO
54	Mrs. Sonam Yangdon	Thimphu	Dept. of Livestock	Asst. LO
55	Mr. Saha Bir Rai	Thimphu	Dept. of Agriculture	Chief
56	Mr. Sonam Yarphel	Thimphu	PPD, MoAL	Planning Officer
57	Mr. Tshering Dorji	Kanglung	RNR- Khangma	Agriculture Officer
58	Mr. Tenzin Lungdhok	Trashigang	KIL, Chenari	Marketing Officer

12.10 List of individuals interviewed

Name of Individual	**Gewog**	**Dzongkhag**	**Business**
Karma Dorji	Samkhar	Tashigang	Milk Transporter
Dawa	Chaskhar	Mongar	Milk Transporter
Sangay Choedra	Mongar	Mongar	Milk Transporter
Sonam Gyeltshen	Kalapang	Mongar	Mushroom Farm
Dawa	Chaskhar	Mongar	Milk Transporter
Sangay	Samkhar	Tashigang	Vegetable Trader
Jamyang Singye	Phuntshothang	S/jonkkhar	Samjong (Sales outlet and food Court)
Kinley Gankhang	Phuntshothang	S/jonkkhar	Family yogurt
Sonam Gyeltshen		Mongar	Samara Organic Mushroom farm

12.11 List of groups/cooperatives consulted

Name of cooperative	**Village**	**Gewog**	**Dzongkhag**	**Representative**
Koufuko International Ltd	Pam	Samkhar	Tashigang	Chenery Staff
Nazhoen Gongphel	Town	Mongar	Mongar	Women Group
Langchenphu Organic vegetables Group	Langchenphumed	Langchenphu	S/jongkhar	Chairperson
Wooling Samtencholing Om Namlay Tshoday	Wooling	Orong	S/jongkhar	Chairperson

Jangchubling Mandar Om Thuedrel Tshogpa	Jangchubling	Orong	S/jongkhar	Chairperson
Dewathang Milk Marketing Corporative	Dewathang	Dewathang	S/jongkhar	Milk transporter
Kangma Chikthen Gonor Dentshen	Khangma	Yurung	Pemagatshel	Secretary
Milk Collection Van: Tsharsi-Dagor	Tshartsi	Nanong	Pemagatshel	Milk Transporter
Shingchuri Semhechum Detshen	Shingchuri	Dechenling	Pemagatshel	Mr.Pema Chorten
Family Yogurt		Phuntshothang	S/jongkhar	Kinley Gankhang
Wengkhar Om Dhaytshen	Wengkhar	Mongar	Mongar	Tshewang Pelmo
Thunder Dhaytshen	Phosorong	Mongar	Mongar	Karma Lhatu
Dangling Dungkar Choeling Gonor Detshen	Rongthung	Khanglung	Trashigang	Sonam Gyeltsehn
Gonor Sanam Nyamdrup Detshen	Kidheykhar	Mongar	Mongar	Pema Yangzom
Pam Midoe Namlay Detshen	Pam	Samkhar	Trashigang	Karma
Tashi Tsheringma Namlay Detsen	Rangshikha	Samkhar	Trashigang	Ugyen
Batso Dhari Tshogpa	Chaling	Shongphu	Trashigang	Dawa Gyeltshen
Zambala Detshen	Jaibab	Mongar	Mongar	Rinzin Wangchuk
Deothang Milk Marketing Namley Tshogdey.	Kebsa	Deothang	S/Jongkhar	Yanki Lhamo
Druk Chethen Namlay Tshodue	Gongthung	Yangner	Trashigang	Tashi Penjor
Jangchubling Mandar Om Thudrel Tshogpa	Mandar	Orong	S/Jongkhar	Sonam Dendrup
Wooling Dairy Farm	Wooling	Orong	S/Jongkhar	Nima Gyalpo
Yatong Gonor Gongphel Detshen	Chasker	Chaskhar	Mongar	Tshechi
Kharnang Lamtha Lamwog Nyamrub Detshen	Babung	Chaskhar	Mongar	Kota
Gomdar Om Nyamlay Tshokdhey	Tshangchillo	Gomdar	S/Jongkhar	Kezang Dawa
Mandaire Thundrel Deltshen	Dortsun	Orong	S/Jongkhar	Tshering Phuntsho
Menjigang Om tshogdrel detshen	Menjigang	Phuntshothang	S/Jongkhar	Bim Bdr

Jersy tshochung thuendrel detshen	Gorthungma thizor	Martshala	S/Jongkhar	Namshey Dorji
Jamkhar milk desthen.	Thachama	Jamkhar	T/yangtse	Drupchu
Wangphu Yusum Thruendrel Detshen	Wangphu	Martshala	S/Jongkhar	Namgey Wangchuck
Pemathang Omley Tshongley Detshen	Pemathang	Pemathang	S/Jongkhar	Sangay Tenzin
Langchenphu Om Tshogdrel Detshen.	Langchen phu	Langchen phu	S/Jongkhar	Tenzin Lungten
Tangrong Om Detshen	Tangrong	Kortoed	Lhuntse	
Khangma Gonor Chithuen Group	Khangma	Yurung	Pemagatshel	Rinchen Chedup
Chidhen Tshephel Detshen	Nangkor	Shumar	Pemagatshel	Norbu Dema
Zambala Milk Cooperative	Norbugang	Norbugang	Pemagatshel	Pema Wangda
Tshatshidagor Norlha Detshen	Tshatshi	Nanong	Pemagatshel	Sonam Choden
Tokarie Om Tshongley Detshen	Tokarie	Nanong	Pemagatshel	Pema Wangda
Woongchilo Om Tshongley Detshen	Woongchilo	Nanong	Pemagatshel	Pemba Tshering