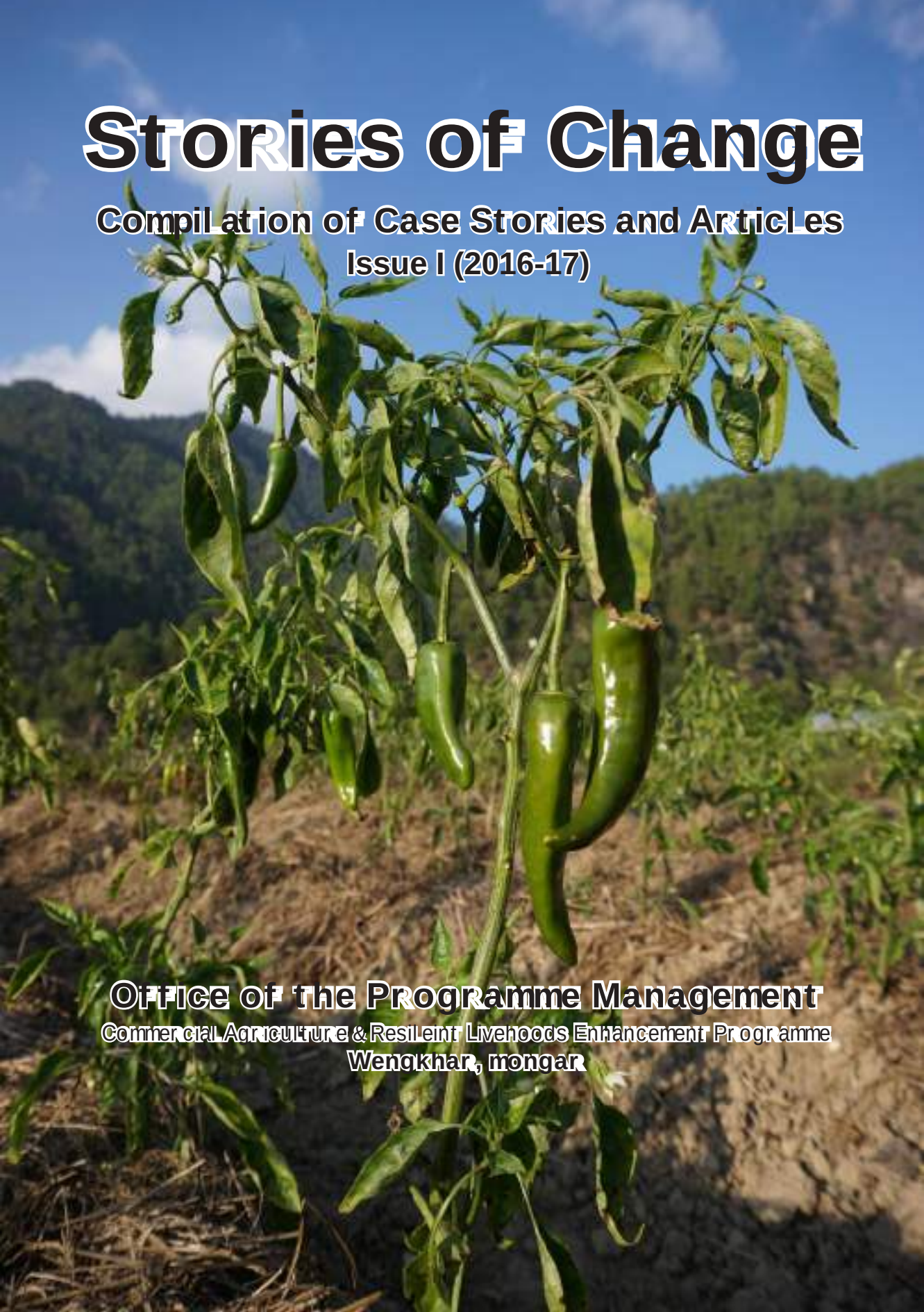
Stories of Change

Compilation of Case Stories and Articles

Issue I (2016-17)



Office of the Programme Management

Commercial Agriculture & Resilient Livelihoods Enhancement Programme

Wengkhar, mongar

Commercial Agriculture and Resilient Livelihoods Enhancement Programme

Stories of Change

Compilation of Case Stories and Articles

Issue I (2016-17)

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Programme Profile

Programme Title: Commercial Agriculture & Resilient Livelihoods Enhancement Programme (CARLEP)

Location: Six eastern Dzongkhags (Lhuentse, Mongar, Pema Gatshel, Samdrup Jongkhar, Trashigang and Trashi Yangtse) and will be scaled up in Chukha, Sarpang, Tsirang and Zhemgang Dzongkhags for vegetable value chain in the second phase of the programme (see Maps alongside).

Implementing Agencies: Ministry of Agriculture & Forests (as the lead implementing agency) in collaboration with FCBL, ARDC Wengkhar, RLDC Kanglung, RAMCO Mongar and Programme Dzongkhag Administrations.

Goals & Objectives: The overall programme goal is to sustainably increase smallholder farmers' incomes and reduce rural poverty through climate resilient commercialized production of crops and livestock by programme households linked to nationally organized value chains and marketing systems.

The specific objective is to increase returns to smallholder farmers through climate resilient production of crops and livestock in nationally organized value chains and marketing systems.

Outputs: 1. Increased production resilience, diversification and innovation

2. Vegetable production intensified and expanded

3. Dairy production intensified and expanded

4. Resilient vegetable and dairy value chains developed

5. Agricultural commercialization and enterprise development strengthened

6. Community driven strategic market infrastructure developed

7. Strengthened value chain and marketing knowledge and communication

8. Climate change resilience and value chain lessons mainstreamed in agricultural policies and sector strategies

Components: Component 1: Market-led Sustainable Agricultural Production

Component 2: Value Chain Development and Marketing

Component 3: Institutional Support and Policy Development

Component 4: Programme Management, Coordination and Monitoring & Evaluation

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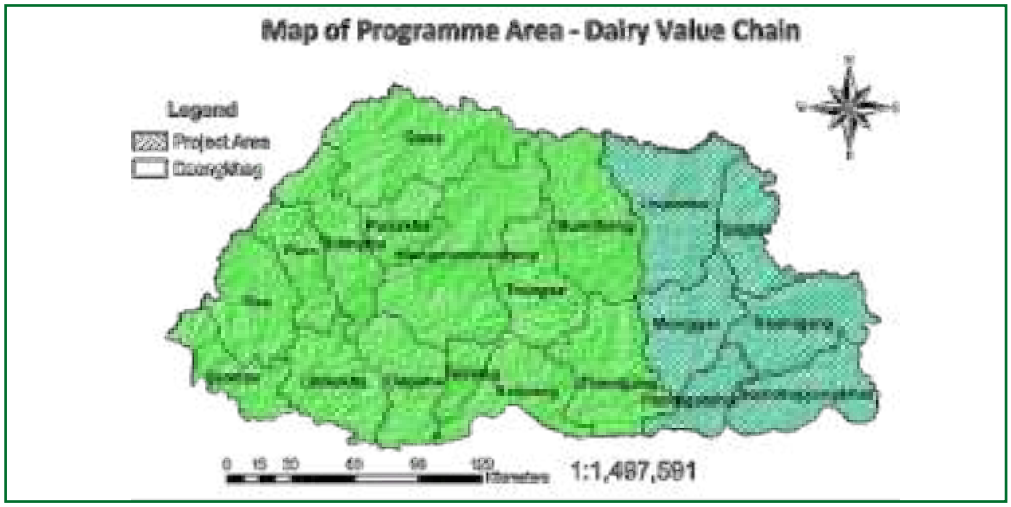
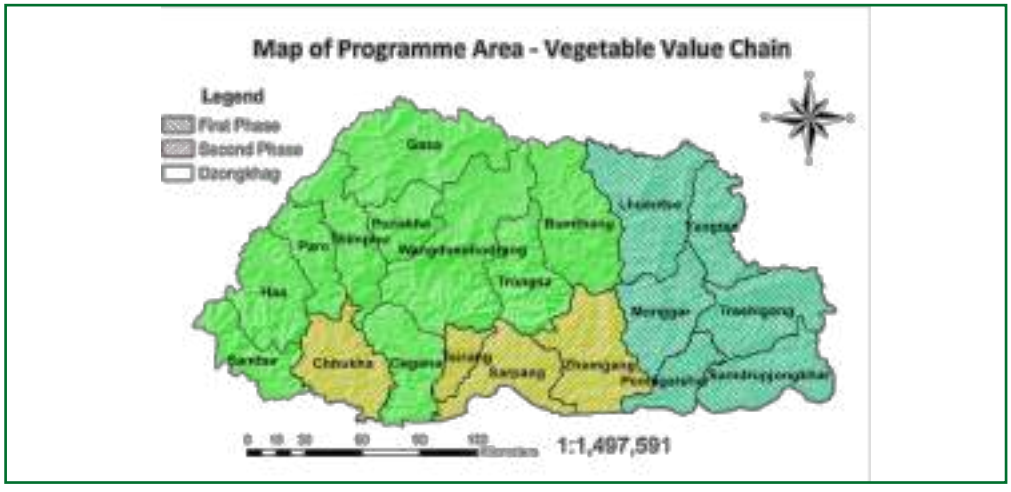
Programme Prof le

Programme Area

The programme will target selected Gewogs in six eastern Dzongkhags (Lhuentse, Mongar, Pemagatshel, Samdrup Jongkhar, Trashiyangtse and Trashigang) with high production and marketing potential in the selected value chains. The programme will benef t 28000 smallholder HHs of which 5000 HH will directly benef t from vegetable and dairy value chains.

In its second phase (post 2018 and depending upon the performance during in MTR and RGoB's priority), the programme will be scaled-up in Gewogs with high production and marketing potential for the vegetable value chain in the south-central and south-western Dzongkhags (Chhukha, Tsirang, Sarpang and Zhemgang), adding 7500 direct benef ciaries (1500 HH).





Commercialization of Vegetables Enhances Domestic Production and Farmers' Income

Kezang Lhadon[1], Yeshi Lhadon[2], Tshering Pemo[2] and Sonam Pelden[2] & Phub Thinlay[3]

Tomato plantation at Autsho Commercial Site, Lhuentse

Introduction

In order to expand commercial vegetable production with support of the Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP-IFAD), the implementation of the vegetable intensif cation is planned to be led by both the Dzongkhags and the Agriculture Research and Development Centre at Wengkhar (ARDC Wengkhar). This approach is taken up mainly to focus interventions to potential areas and bring about a visible impact in terms of benef ciary participation, area expansion and income enhancement instead of scattering the project supports.

A total of six commercial vegetable production sites were identif ed to be led by ARDC Wengkhar and another six to be led by Dzongkhags. These sites allocated for the centre to establish and start commercialization of vegetables is shown in Table 1.

Approach

The commercial vegetable production sites were identif ed by the Dzongkhags mainly based on the production and marketing potentials and were discussed during the Annual Work Planning and Budgeting exercises (AWPB) and f nalized. Subsequent to the identif cation of the sites, the focal persons from the ARDC responsible for the Vegetable Commodity program visits the sites and

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carry out a f eld visits and assess the situation and carry out consultations with the benef ciaries. A cropping plan is then developed for reference in implementation of the activities.

Accordingly, production input supports required for the intervention are identif ed and f nalized for procurement in consultation with the ARDC Management. Production supports provided for the sites for the 2016-17 FY are shown in Table 2.

Depending on the seasons, focal of cers in consultation with the gewog extension and farmers began implementation of the program with periodic monitoring and supervision at the sites.

Vegetable expansion and increased income

A total of 186 farmers (116 Men and 70 Women) farmers took part and benef tted from the program covering a total of 58 acres of land brought under commercial vegetable production. A mixture of vegetable crops such as broccoli, beans, cabbage, chilli, tomatoes were promoted. In order help them address production constraints, the benef ciaries were also supported with other production supports such as f exible pipes, syntax tanks, sprinklers, watering can and sprayers.

The production data for the season from f ve of six sites showed that farmers have made considerable progress. In Autsho, much of the site that remained fallow in the past is now reverted to farming. The farmers in Autsho have generated a total of Nu. 297,210.00 (average per farmer Nu. 17,482) and in Mongar, the income is reported at Nu 235,000 (average Nu. 9,791 per farmer). In Pemagatshel, growers reported an income of Nu. 143,550 from the vegetables cultivated this season (average of Nu. 5,126 per farmer) and in Samdrup Jongkhar, farmers benef tted with a total income of Nu. 128, 885 (Average of Nu. 4,603). In Trashiyangtse, income from vegetables excluding potato and chilly is at about Nu 183,000 (Average of Nu 4,066 per farmer).

Conclusion

With increasing opportunities from the importance given to domestic vegetable cultivation especially targeting the lean season from December to March, potential sites in the Dzongkhags suitable for commercialization could be focused and available resources provided to these to bring about a larger impact in terms of area expansion and increased income for farmers.

Subsequent to or in process of promoting commercialization of vegetables in the particular site also open up entry points for opportunities for cooperative farming approaches especially during the initial stages of cultivation i.e. at the nursery production, crop protection and marketing. With the need to engage youth in farming, commercialization of vegetable that results in income generation could also be an entry point for youth engagement in farming.

1. Serior Agriculture Supervisor, ARDC Wengkhar, Mongar
2. Agriculture Supervisor, ARDC Wengkhar, Mongar
3. Assistant Dzongkhag Livestock Of cer, Lhuentse

Table 1: Commercial Vegetable Sites and Income Generated (2016-17)

Dzongkhag and Gewog	Site	No. of Farmers (Male)	(Female)	Total Area (Ac)	Gross Income (Nu.)
Lhuentse, Tshenkhar	Autsho	9	8	5	297210
Mongar, Drepong	Zunglen	9	15	4	23500
Mongar, Mongar	Khalangzi	3	0	13	-
Pemagatshel, Zobel	Tshelingor	12	16	9	143550
S/Jongkhar,	Deptshang	28	3	2	128885
Trashiyangtse,	Bephushoed	30	15	15	183000
Trashigang, Udzorong	Lamzang	28	14	10	Started in Sept. 2017

Beans cultivation at Autsho Commercial site, Lhuentse

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Chili grown under greenhouse at Zunglen, Mongar

Beans Cultivated in Autsho, Lhuentse

Cabbage cultivation at Khalanzee, Mongar

Winter Potato: Udzorongpas Unseen Hope

Narayan Subba[1] and Sangay Choda[2]

Winter potato plantation in paddy f eld of Udzorong

Agriculture activities remains in full swing even in winter season for the farmers of Udzorong, during which they cultivate potato, onion, chilli, tomato and spring maize. They use wetlands for vegetable cultivation after paddy. The wetland is situated at an elevation of 610- 700masl in dry sub-tropical climate, where winter vegetable production is suitable given the availability of irrigation water.

The 46 acres of wetland owned by 160 households is known by various name Lamzanghung, Samgang, Shengreetsho and Khengree. It was left fallow for almost a decade due to wildlife encroachment, free cattle grazing and lack of cooperation among the landowners. In 2013, the matter was raised in Gewog Tshogdey (GT) and the committee decided to revive the fallow land. Gewog Agriculture Of ce was to lead the activities in collaboration with Gewog Administration.

In f scal year 2014-15, with support from National Plant Protection Center (NPPC), solar fencing was installed around the wetland with labor contribution from the farmers. Since 2015, farmers started winter vegetable production in the wetland with supports in fund, seeds and other inputs from Gewog Administration, Dzongkhag Agriculture Of ce and Agriculture Research and Development Centre (ARDC), Wengkhar.

Lamzang wetland is now becoming commercial hub for the Udzorongpas. Before 2014 the wetland was utilized for single season (paddy cultivation), but after the solar fencing the wetland was utilized for all season, cultivating various vegetable

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and cereal crops. In winter the stream gets clean and free of sedimentary load, while in summer the stream gets muddy and sandy, depositing sands in paddy f elds.

In 2016-17, CARLEP supported mass early potatoes production at Lamzanghung with supply of 10,000 kg of potato tuber benef ting 45 households. 10 acres of early potatoes was cultivated aimed to reduce import of potatoes form Indian during winter season. The f rst ever early potatoes cultivation yield around 42 mt from 10 acres of wetland.

Early potato is cultivated in December and harvested in February when there is shortage of potato in the market. It is one of the high income generating crops which can fetch Nu.30/kg in local market. The production from one acre of wetland is approximately 3800 to 4300kgs. Now, the farmers of lower Udzorong produces enough early potatoes and they don't have to depend on farmers of upper parts of Udzorong like Cheya, Mankhar and Drothphu where potatoes production is huge.

The farmers sells potato mainly in local markets such as Udzorong Central School, Khentongmane, Kanglung and Trashigang. However, most of the farmers prefer Kanglung and Khentongmane to Central School because the price of potato is low in central school.

The whole success is due to immense support from Dzongkhag Agriculture of ce, ARDC-Wengkhar, CARLEP and Gewog administration for moral support. In the path of success true actors are the benef ciaries and their positive thoughts towards production level. Currently, the Udzonrongpas are constructing low cost poly houses to begin cultivation of vegetable under protected structures.

1. Agriculture Extension, Udzorong, Trashigang.
2. Programme Support Of cer, OPM

Potato is rapidly becoming top cash crops for the people of Lower Udzorong

Towards commercialization of Garlic in Brekha and Bayphu

Pema Wangchuck[1] and Karma Wangmo[2]

Introduction

Commercialization of Garlic in Brekha and Bayphu Chiwog under Khaling Gewog of Trashigang was recently initiated by the Gewog Agriculture Extension Of ce as a 3rd commercial crop to rural economy.

Besides the regular trend of potato cultivation as the commercial crop, the large scale Rajma bean cultivation was promoted as a 1st commercial crop to potato. Rajma bean was found to f ourish in Jeri village under the gewog and the crop good commercial value in the market with high nutritional content. Rajma bean cultivation was expanded in Brekha and Bayphu Chiwog in 2016.

Similarly, a large-scale ginger cultivation was also initiated by the Gewog Agriculture Extension Of ce in the same year as a 2nd commercial crop to Rajma bean.

In FY 2017-18, with support from CARLEP the Gewog Extension Of ce initiated large-scale garlic production as the 3rd commercial crop. The Commercialization initiations are emphasized mainly because there is the relatively higher rate of poverty and to reduce the risk related to single cropping. These promotional crops were introduced as winter crop so that land does not remain fallow in winter and the crop can be marketed easily due to its long shelf life even under normal post-harvest management in the farmers' f eld.

Commercialization Initiation process

Farmers' consultative meeting

Farmers' consultative meeting was conducted separately in Brekha and Bayphu on 25th and 28th September, 2017 respectively. The community members gathered to plan for large-scale production of garlic. The strategic plan for garlic production as a group or community-based in a large single plot for each group/ community were discussed so that the farmers can pool the labor force, training resources, and knowledge exchange. The consultative meeting drew consensus within the farmers to cultivate the garlic in a group.

Group Formation

Of the 69 interested farmers from the two Chiwogs who are willing to grow garlic in large scale, 40 farmers (28 female, 12 male) have consensually formed the group.

These 40 farmers were divided into a total of six groups. Each group has the executive members appointed who will initiate and lead the group function. The group bylaws were formed and the necessary technical training in the group formation was facilitated by the agriculture extension of cer.

Plot allocation and Field preparation

Following the group formation, the farmers identif ed land suitable for garlic cultivation. On an average, each group has agreed to cultivate the ginger in a total of 0.20 acres of the land. The agriculture extension trained the farmers' group in preparing the bed of 1meter width and a reasonable length based on the site location.

Each group was demonstrated and trained to raise the proper beds, provide proper drainage, maintain soil moisture, make it pliable soil for easy bulb formation, minimizing risk of rust diseases and to

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conserve the soil fertility.

Seed distribution and plantation

With support from CARLEP through Dzongkhag,260kgs of garlic seed was distributed to the farmer's group.

For the plantation, the farmers were guided on technical garlic cultivation methods which includes bedding and spacing. Farmers were advised to keep a desirable space so that plant will be vigorous and resistant to minor pest and diseases, good bulb formation, easy management and for the sake of good aeration and minimize the fungal (rust) diseases.

Mulching of the cultivated plot

In the traditional method of vegetable plantations, mulching is not a common practice. Most of the time, farmers are seen keeping their cultivated plot without mulching or covering. In order to shift this traditional practice of plantation without mulching, the agriculture of cer facilitated the mulching process and advised all the farmers to mulch the cultivated land to minimize the weed pressure, conserve the available soil moisture, deter pests, and supplement the soil nutrients and soil compaction.

The farmers were demonstrated to maintain the right level of thickness while mulching so that the mulching materials will not suppress and intervene the crop germination. The farmers were also advised to remove the mulching materials after 80% of the crop germination.

Conclusion

With all the training and seed expenses are borne under the support of CARLEP, a total of 1.30 acres of the land which was initially left fallow was brought under garlic plantation in Brekha and Bayphu Chiwog.

This commercial intervention is directly benef ting to 40 households who have formed the group and 29 other households who haven't formed the group but availed the training sessions.

1. Gewog Agriculture Extension, Khaling Gewog, Trashigang, MoAF. 2. Knowledge Management Of cer, OPM, CARLEP

Garlic Plantation at Brekha, Khaling

Wangrimo Starts Vegetable Commercialization

Chimmi Drakpa[1], Karma Tobgay[2] and Karma Wangmo

Wangrimo vegetable commercial site is located near the Drangmechhu at an elevation of 820-950 masl under Ramjar Gewog in Trashiyangtse. Wangrimo was identif ed as a 'Commercial Vegetable production site' by the Dzongkhag under the CARLEP in 2016-17 due to fertile gentle slope land and warm sub-tropical climate suitable for tropical fruits and winter vegetables.

A total of 15 acres of wetland was brought under 'Early Chili production', engaging 50HHs (35 HHs were female headed).

In April 2017, a total of 5MTs of chilli was harvested, of which, 2 MTs were marketed to the Centenary Farmers Market, Thimphu at Nu. 210/kg, while the remaining chilli was marketed to the Doksum and Yangtse town at a farm gate price ranging from Nu 120-150/kg.

Watermelon plantation was also done with support from Agriculture Research and Development Center (ARDC), Wengkhar. Agriculture Extension Of ce also distributed 9300 numbers of Cardamom rhizomes and the assorted vegetable seeds in the village.

Farmers of Wangringmo harvested good Early chili yield because of the adequate water supply. The prevailing water shortage issue in the village was addressed after the construction of a water reservoir tank measuring 12 m3 at the total cost of Nu. 0.546 Million, with fund support of CARLEP.

In addition, the farmers of Wangrimo received two exposure tours and training facilitated by gewog agriculture extension through CARLEP's support. In FY 2016-17, 5 farmers (8 male and 7 female) were sent on 11 days visit to the southern part of the country to get familiarized on the agricultural practices. Similarly, another 4 days farmer's extension visit was organized involving 14 farmers (5 male, 9 male). They visited various farms within the Dzongkhag. A vegetable production training was also conducted with some selected farmers in the village .

Meanwhile, in order to address the marketing problem especially in the peak vegetable seasons, a market shed in the village is also under construction. The shed is expected to safely store the vegetables in the case of excess harvest.

This production support in the village rendered by CARLEP-IFAD routing through Dzongkhag and gewog agriculture extension has increased the economic return of the farmers and also equipped them with various agricultural practices after the exposures tours and training. Thus, the village will henceforth continue the commercialization and production of vegetables in an intensif ed manner next to paddy.

1. ADAO, Trashiyangtse. 2. Gewog Agriculture Extension, Yangtse Gewog.

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Milk Chillers: A Solution for Milk Quality Deterioration

Norbu[1] and Sangay Choeda[2]

Milk Chiller installed at Khabtey MCC with supports from CARLEP

The livestock sector, dairy processors in particular have been recurrently facing the problem of unhygienic milk production by dairy farmers. The concept of clean milk production was almost non-existent among smallholder dairy producers of Trashigang in the past as the greater mass of produced milk got locally processed into butter and cheese.

The importance of hygienic milk production was only realized when Kofuko International Limited (KIL) located at Chenari started collecting fresh milk from the farmers under Trashigang Dzongkhag. Since then, an ef ort to improve milk quality from source and in transit was prioritized with RLDC, Kanglung even spearheading a separate program with. CARLEP support in imparting robust training on clean milk production to the smallholder dairy farmers and that has seen tremendous improvement in terms of bacterial count in milk. “The bacterial count in milk before the training was found to be exceeding 500000 cfu/ml but after the training it dropped to as low as 150000 cfu/ml”, Said Dairy Technologist Tashi Zangmo from RLDC, Kanglung. However, the production of clean milk continues to be a major challenge despite vigorous awareness programme and training. The current status of bacterial count in milk supplied to Chenari Dairy Plant ranges

from 200000-500000 cfu/ml.

Besides unhygienic milking practices, the equipment usage, engagement of transports devoid of chilling facility and storage have been the major sources of contamination. Farmers go through numerous hardships when transporting their produce from farm to collection centers and a farmer, Thinley Dorji from Bikhar speaks of relief and ef ectual investment on installation of milk chilling machine in the collection center through CARLEP support. The installation has helped him and others reduce wastage and avoid fresh milk spoilage which they constantly faced prior to programme's intervention. The chilling center at Bikhar-Domkhar also collects or pools milk from few commercial farms located nearby. A commercial farmer with 15 numbers of dairy cattle from Bikhar, Dorji Tshering is one of the benef ciaries supplying 45 liters of milk daily to the chilling center freeing himself of the processing and marketing duties.

Dairy groups of Khapti-Bikhar, Bikhar-Domkhar and YengangBrangsa received 500 liter capacity chiller each during 2016-2017 with fund from CARLEP through RLDC, Kanglung. Installation of chilling machine, imparting of training on clean milk production and supply of milk cans created conducive environment for dairy value chain to function. The travel of KIL's milk tanker in the area has drastically reduced because of the installation of milk chilling machine in the collection centers. One can already notice how dairy value chain is starting to take its form in Samkhar Gewog of Trashigang.

1. Component Manager, Livestock, OPM
2. Component Manager, Value Chain and Marketing, OPM, CARLEP

Milk chilling van from Koufuku International Limited collecting milk from Khabtey MCC

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Silage Making Practice Picking Up in Yadhi

Norbu

Provision of silo pit and chaf cutter encourages silage making at Yadhi

Located at the lateral highway between Mongar and Trashigang, Yadhi is a hamlet under Ngatshang gewog. At present, the whole stretch of village makes up “Yadhi Milk Group” comprising of 60 active members which evolved from mere 15 member group, who possessed not more than one or two local breed cattle, when it was formally instituted in 2010. Back then, collection and processing was a nightmare since the production was not suf cient for processing. Today, the group collects 200-250 liters of milk every day and process into butter and cheese at the Milk Processing Unit (MPU).

Although the group witnessed mild progress in terms of membership and production during the last half decade, the full potential remain untapped mainly due to lack of knowledge on increasing fodder resource base, as feed and fodder accounts to more than 70% of the production cost in dairy farming. The group members were skeptical that dairying with limited land holdings may not be possible. In the past, farmers have been depending on forests for its fodder when they rear local cattle. Now with change in livestock rearing system from forest grazing to stall feeding, abundant fodder availability in homestead is required for successful dairying. From this perspective, scarcity of land is directly proportional to scarcity of green fodder which is one of the main hindering factors in taking up dairy farming. Despite these challenges, smallholder dairy farmers of Yadhi have travelled a long way paving road to robust dairy development through the support of Government and past IFAD interventions.

Fodder shortage at Yadhi is largely a winter phenomenon when climatic conditions coupled with lack of irrigation makes the situation of fodder development worst. It is evident from the unavailability of cheese and butter in the market during winter

months. This problem arises when the dairy animals undergo nutrition crisis making milk yield to decline drastically. However, during summer months when the area is covered with green (natural grasses) and abundant crop residues (maize stalk), the animals get aplenty to feed upon and this is the time where the farmers encounter seasonal surplus of dairy products (butter and cheese).

To continue to boost dairy sector in particular, livestock sector has been emphasizing on increasing fodder resource base, especially in winter months, by capitalizing on the surplus fodder available in summer months. Likewise, CARLEP-IFAD's focus is on how to improve animal nutrition so that the production corresponds to dairy value chain which is the main impetus of the CARLEP-IFAD project.

Silo pits promoted in Yadi, Ngatshang

Therefore, CARLEP has made provision of subsidiary support for fencing pasture area, supply of free fodder seeds and seedlings, supply of chaf cutter, material support for construction of silo pit, demonstration and training related to fodder conservation and crop residue enrichment techniques. All these activities were undertaken through Dzongkhag Livestock Sector.

The most prominent result one can see in the f eld is 50 silo pits supported through CARLEP-IFAD and it's amazing to appreciate that all 50 pits are f lled with silage (maize silage) which is one to two months old. What is more interesting is chaf cutter has proven wonders when the small equipment could chop approximately 3000 kgs of fodder per hour.

"Silage making would not have been materialized if all the chopping has to be done manually in absence of wonderful chaf cutter supported by CARLEP-IFAD," said Tashi Tshomo, one of the benef ciaries of the Programme.

Dechen Zangmo, another benef ciary of the Programme said, "Come winter season, I don't have to worry about fodder as I have ensiled about 12000 kgs of maize in the silo-pit."

Acknowledging the support of CARLEP-IFAD, Yadhi dairy group members are optimistic and looking forward to achieving optimum milk yield during lean season by feeding silage prepared during this time of the year (summer and autumn seasons).

Similarly, Chaf cutter in Yadhi has not only encouraged farmers to make silage but has also reduced household drudgery

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in chopping fodder grasses and improved digestibility and minimized wastage. “I had to chop maize stalk and Napier grass manually before which took away so much of my valuable time. Now I can chop within no time and I get plenty of time to do other works- Thanks to chaf cutter,” said Tshering of Pelshub village under Ngatshang gewog.

The Senior Livestock Extension Of cer of Ngaatshang gewog said, “I made the members to compulsorily construct silo-pit and after the constructions were complete I imparted practical demonstration of fodder conservation (silage making technique) in one of the members’ f eld.” This demonstration was critical for other farmers to take up the technology and within a week or two all other farmers who constructed silo-pit picked up and adopted the technique. He adds on and said, “Every silo-pit is f lled with silage and they can feed their animals during winter and I hope the production will def nitely increase bgbas compared to last winter.” Some of the farmers have already started feeding one month old maize silage and found out that intake by the animals are promising.

Taking advantage of seasonal surplus of fodder and converting it into silage or hay complemented by some other fodder (nutrient enrichment of paddy straw, maize stalk, fodder trees) and concentrate feed could potentially supply year round fodder requirement of the animals, provided right technique and suitable environment is created to the farmers through subsidiary support as is provided by CARLE_IFAD project in the east. Because of these, the smallholder dairy farming in the east has immense potential for growth and increasingly remain largest producer of milk among the regions of the country.

Similar support was given to other groups (Redaza, Ngatshang, Chaskhar) under Mongar Dzongkhag and farmers have started reaping benef ts of the CARLEP-IFAD project in the east.

Chaf Cutter being promoted by CARLEP

Motivating the farmers towards sustainable dairy production

Phurpa Tshering[1], Tshegay Norbu[2] and Karma Wangmo.

With the shift in the livestock rearing pattern from open grazing to stall feeding, it is comprehensive to focus on low volume and high value improved cattle breeds. Moreover, with the decline in the number of the economically-active age group of people in the villages, it is realistic to attract them back in the farming with the provisions of assets that has the higher and quicker rates of production.

CARLEP supports for the imports of high yielding cattle breeds to be distributed to the interested farmers on a cost-sharing mechanism of 30:70 between the Programme and the farmers respectively has uplifted the economic and the nutritional status of the region.

A total of 246 numbers of high yielding cattle were imported in the f nancial year 2016-17 by the six Eastern Dzongkhags, of which 20 numbers were imported by Lhuentse Dzongkhag with the goal of achieving self-suf ciency in dairy products.

The 20 heads of Jersey cattle for Lhuentse Dzongkhag was imported from West Bengal, India in April 2017 under the facilitation of the of cials from the Dzongkhag Livestock sector and farmer representatives.

Upon reaching the cattle in the quarantine station at Samdrup Jongkhar, the interested farmers had the lucky-draw system to pick the cattle of their own. The imported cattle were distributed on a cost-sharing mechanism of 30:70, where 30% of the total cost of each cattle was borne by CARLEP with an approximate fund of Nu. 0.5 Million.

In order to maintain the hygienic condition of the cattle, reduce the mortality rate and improve the production quality and also to improve the sanitation in the rural villages, CARLEP has provided a support for the construction materials like CGI sheets, ridging and cement for improved cattle sheds with the silo-pit facility. The owners of the imported improved cattle breed were also trained on the dairy management practices.

However, outsourcing of dairy cattle from outside the country was found challenging due to the requirement of long procedures including searching and selecting of the quality breed, disease-free cow, cattle stationing at quarantine, the risk of high mortality rate and high charges.

Moreover, the cattle owners are found facing hardships in the hybrid cattle management at the farm level due to requirement of extensive care and formulated feeds and fodders. Thus, the Livestock sector of Lhuentse Dzongkhag is not in favor of importing improved cattle, and, recommended to have plans for production of hybrid cattle within the country for sustainable dairy farming.

1. ADLO, Lhuentse Dzongkhag. 2. Gewog Livestock Extension, Lhuentse.

Participatory Vulnerability Assessment and interventions to enhance community resilience to Climate Change through establishing Climate Smart Villages (CSVs)

-Kinley Tshering[1], Lhap Dorji[2], Tashi Phuntsho[3], Tashi Wangdi[4] and Dorji Wangchuk[5]

Introduction

The implementation of Commercial Agriculture and Resilient Livelihoods Enhancement Program (CARLEP), an IFAD and MoAF supported Program in six eastern Dzongkhags deploys a two pronged approach in which areas with high potentials of commercialization follow a value chain intervention while areas with vulnerability from climate change impacts follow a targeted intervention approach.

In 2016-17, a total of six Climate Smart Villages (CSVs) were identif ed by the target Dzongkhags for intervention led by the Agriculture Research and Development Centre at Wengkhar with assistance from other implementing agencies such as the Regional Livestock Development Centre at Khangma (RLDC), Regional Agriculture Marketing and Cooperative Of ce (RAMCO), Dzongkhag Agriculture and Livestock Sectors and gewog extension centers in respective sites.

In order to ensure appropriate interventions for respective sites, ARDC Wengkhar carried out Participatory Vulnerability Assessment and Planning Exercise in these six sites in 2016-17 and prepared for interventions immediately or in subsequent years with supports through ASAP Trust Grant under CARLEP-IFAD. The vulnerability assessment of the proposed sites was carried out through Participatory Action Research (PAR) approach involving the communities mainly to understand the extent of exposure, sensitivity and their adaptive capacity towards adverse impacts of climate change, including climate variability and extreme events and accordingly identif ed interventions.

Climate Smart Villages

The six CSVs identif ed by the Dzongkhags based on their remoteness, poverty, natural resource situation and vulnerably to climate change impacts are shown in Table 2. At least one village from each project site was considered.

Table 2. CSV identif ed in the region for intervention 2016-17 FY

Dzongkhag	Gewog	Village	Altitude (m asl)	*AEZ	No. of HHs
Mongar	Thangrong	Ngarpengtang	1400	Dry Sub-tropical	47
Lhuentse	Kurtoed	Jatsabi	1500	Dry Sub-tropical	11
Trashigang	Kangpara	Therphu	1400-1600	Dry Sub-tropical	30
Trashiyangtse	Yalang	Dukti	1700-1900	Warm Temperete	24
Pemagatshel	Dungmin	Woongborang	1699	Dry Sub-tropical	20
S/Jongkhar	Wangphu	Pangthang	1500	Dry Sub-tropical	58

Vulnerability Assessment

The vulnerability assessment of the proposed CSVs was carried out through Participatory Action Research (PAR) approach following the guidelines and tools tested for planning, monitoring and evaluation of climate change adaptive capacities. The approach and tools used for the vulnerability assessment through PAR are as shown in Table 3.

Climate change is not happening in isolation, but is coinciding with many other trends and stresses on livelihoods and its impact dif erently af ect gender. In order to mainstream gender dimension in data collection, analysis and to ensure interventions of the program is gender sensitive, both men and women farmers were involved in the process of vulnerability assessment and planning.

Results of the Vulnerability Assessment – Problems and Interventions

A detailed analysis of the assessment was carried out by Tshering, et.al. 2016 using the tools mentioned in Table 3. The analysis mainly focused on understanding the natural resource situation, livelihood sources and trends in climate hazards and coping mechanisms. Appropriate problem census was carried out and identif ed appropriate interventions which were later translated into action plans for the project to take on board interventions during the implementation and help the CSVs to enhance their resilience. Table 4 provides the major problems faced by the CSVs that increases their vulnerability which should be addressed in subsequent years through the Annual Work Plans (AWPs).

While a detail analysis was carried out for respective CSVs and reported by Tshering et.al. 2016, the major interventions required to help CSVs reduce their vulnerability are as follows:

- Human Wild Life Conf ict Resolution
- Promotion of water use ef cient technologies (sprinklers, drips, smart irrigation techniques)
- Water harvesting structures.
- Promote stress tolerant varieties of crops (indigenous and improved varieties).
- Permaculture and Biogas technology
- Sustainable land management techniques.
- Crop diversif cation.
- Promotion of protected agriculture (Low cost poly houses)
- Promotion of native breeds of poultry
- Integrated pest and soil fertility management techniques and
- Capacity building of the communities in natural resource management, crop and livestock management.

Interventions

With funds allocated to ARDC Wengkhar and RLDC, key interventions in the CSVs to enable communities enhance their resilience and improve livelihoods and natural resource situations have started in 2016-17 FY. While a list of interventions have been identif ed through the PVA, depending on the availability of the funds, a selection of interventions based on the priority was implemented.

Complementary supports from other programs

A major intervention need of the communities of 3 CSVs is found to be protection of crops from wild animal for which interventions such as electric fencing was required. Since there is fund

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Table 3. Framework for Participatory Vulnerability Assessment

Tools	Purpose	Process	Information Acquired
Transect Walk	To gain an understanding of the main social, physical and ecological characteristics of the community and surrounding area	Walking through the village to understand the resources, livelihood strategies, visible climate impacts	• Natural Resources • Livelihood strategies • Visible climate impacts • Boundary of the village • Community's infrastructures
Resources & Hazard mapping (Village mapping)	To map the village with members of community themselves drawing it reflecting the main resources (Natutal, physical, financial, social) & climate hazards.	Focus group discussion (gender based), Mapping the resources & climate hazards by the groups, Physical observations.	• Location of the main social, ecological, physical and natural resources of the village. • Identification of vulnerable households. • Identification of main climate hazards faced by the community (male & female).
Livelihood and strategies Profile	Know the different livelihood sources and strategies of the community.	Group discussion, resource mapping	• Identify main sources & livelihood strategies, socio-economic status
Timeline trends & local symptoms of climate change	To understand and identify changes and trends with relation to extreme climate events and variability, local symptoms of climate change.	Group discussion, brainstorming, recall of events by the communities, secondary data.	• Main climate events in the past. • Main climate tendencies over the years. • Impacts of extreme events. • Trend of important production data.
Well-being ranking	To Analyse characteristics of community members from well-being perspective. To understand local perception of "being well".	Participatory listing and ranking of well- being indicators. 2 groups (Male & Female).	• Well-being categories based on identified well-being indicators. • Groups with different vulnerability profiles and their characteristics.
Changing farming practices and crop ranking	To understand the already existing coping strategies that the farmers use. Also to explorethe potential for diversifyinh agricultural practice bu using excisting knowledge and local crops.	Group discussion (male and female separate group).	• Changes in farming practices, their causes & consequences. • Main impact of changes in farming practices. • Main characteristics of local crops. • Existing coping strategies for climate change.
Climate risk and coping mechanism matrix	To identify climate related risks which have the biggest impact on the community and their livelihood strategies. Current coping mechanisms are assessed.	Participatory listing the climate related risks & ranking it. Assess the impact and coping mechanisms.	• Types of climate risk that impact most on people and their livelihood strategies. • Consequences of climate risk. • Existing adaptive capacity.

Table 4. Problem census matrix for all CSVs

Ngarpeng-tang	Jatsabi	Therphu	Dukti	Woongbo-rang	Pangthang
1. water Shortage 2. Wildlife damage 3. Soil Fertility 4. Unavail-ability of Seeds and Seedling 5. Reduction in maize yield due to exces-sive heat 6. No agricul-ture machin-ery 7. Landslide 8. Fodder shortage 9. Unproduc-tive cattle 10. Shortage of f re wood	1. Lack of knowledge on Irrigation water utiliza-tion. 2. Pests and Diseases. 3. No breed-ing bull in the community. 4. Low soil fertility. 5. Fodder shortage. 6. Excessive stones/boul-ders in the farm land.	1. Wildlife damage 2. Poor soil fertility 3. Low agriculture production 4. Shortage of irrigation 5. Post-har-vest losses. 6. Fodder shortage	1. Shortage of winter irriga-tion 2. Poor soil fertility 3. Pest and diseases 4. Post-har-vest losses 5. No donkey 6. No breed-ing bull (Mithun) 7. Fodder shortage	1. Water shortage (winter) 2. Unavail-ability of seeds and seedlings. 3. Poor soil fertility 4. Pest and diseases 5. Low agriculture production 6. Post-har-vest losses 7. Farm la-bour shortage	1. Wildlife damage 2. Market problem for agriculture produce 3. Lack of knowledge on ef ective utilization of irrigation water. 4. Low soil fertility 5. Pests and Diseases 6. Fodder shortage 7. Land deg-radation 8. Unproduc-tive cattle

under IFAD supports for electric fencing, ARDC deployed complementary programs with other development supports in this case the supports of European Union – Climate Change Adaptation Project (EU-CCAP) with the MoAF such that it has a complementary ef ect on the sustainability of the interventions from CARELP IFAD especially in the production enhancement, natural resource management. A total of 38.51kms of electric fence in 3 sites covering 361 acres was established. The remaining sites were already fenced by the Dzongkhags in the past from other development support programs.

Production Support interventions in CSVs

With funds from the CARLEP –IFAD support to ARDC Wegkhar, farmers in CSVs were provided with production input supports such as poly house plastic sheets, Sprinklers, HDPE pipes (one site only), SLM practices and assorted stress tolerant vegetable seeds. Two sets of on farm heat tolerant maize trial was also established in Ngarupengtang village, Mongar with support from Maize program and in Dukti, Trashiyangtse, 250 kgs of upland paddy was also provided. The production support interventions in CSVs benef tted 176 farmers (90 M and 86 F) covering an approximate area of some 133 acres of land in these sites.

Sustainable Land Management Practices – Celebrating International Day to Combat Desertif cation

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Threlphu village, one of the CSVs needed interventions in land management and thus, ARDC Wengkhar, Gewog Agriculture Extension Centre at Kangpara, TrashignagDzongkhag Agriculture Of ce and the National Soil Service Centre organized a Land Management Campaign to celebrate the International Day to Combat Desertif cation 2017 at Threlphu Village under Kangpara geog.

A total of 27 farmers (8 women and 19 Men) directly benef tted from the campaign with planting materials f cus , Napier and broom grass saplings distributed to them for plantation in their farm land to prevent soil erosion as well as provide sources of fodder for their cattles. Naiper grass was planted to establish bioengineering protection across 8 kms of the farm road, a total of 30 acres of land is established with napier hedgerows. Another 400 f cus seedlings were planted by the farmers in their farm pand. About 25 kg grass mixture seeds, 100 bamboo rhizomes, 2000 broom grass and erythinia cuttings were planted in degraded areas in the community to establish natural vegetation cover to prevent soil erosion.

order for ef ectiveness and sustainability of the impacts of production support interventions, bigger interventions such as electric fencing in three of the sites were also put in place through complementary supports from other development support programs facilitated through the ARDC Wengkhar thus resulting in a complementary ef ect on each other.

The interventions in 2016-17 has enabled the centre in benef tting a total of 203 benef ciaries (109 M, 94 F) covering a total of 160 acres under production support and protecting 361 acres with electric fence. Supports in subsequent years should continue to help address the livelihoods improvement, improving access to irrigation water and promoting of permaculture practices for ecologically sound farming practices that can have an impact on enhancing community resilience to climate change impacts.

1. Principal Horticulture Of cer, DoA, MoAF 2. Programme Director, ARDC Wengkhar 3. Agriculture Of cer, ARDC Wengkhar, 4. Cheif, Extension and Production Devision, DoA, MoAF 5. Programme Director, CARLEP

Conclusion

Participatory vulnerability assessment has enabled identif cation of critical areas of intervention and with remaining funds available from the balance spent on vulnerability assessment exercises, ef orts to address the problems identif ed from the exercises have also started in the same year. In

Resource Mapping Excersice during Participatory Vulnarability Accessement of CSV

Promoting Community-based Sustainable Land Management to Enhance Resilience to Climate Change

Pema Dorji Moktan[1], Sangay Choda and Karma Wangmo

Threlphoog Farmers participating in CBSLM: Hedge Row Plantation

Threlphoog is a chiwog of 30 households with a total population of 450 people under Kangpara Gewog. The chiwog is located at 43km away from the nearest highway at an altitude ranging from 1800-2220 masl. Agriculture and livestock farming is primary source of livelihoods for the people. The farmers grow maize, paddy, upland paddy, chilly, potato and other vegetables. However, the production is at small scale and for domestic consumption.

Owing to the remote location, distance from market and subsistence nature of farming, the chiwog was selected as Climate Smart Village (CSV) under Targeted Intervention of CARLEP. The selection was carried out by the Dzongkhag in consultation with Gewog Administration. The concept of permaculture is promoted which includes prioritizing 'Community-based Sustainable Land Management (CBSLM) in building resilient CSV towards the impacts of Climate Change.

Community-based Sustainable Land Management is an approach which involves local communities in implementation of integrate land, water, biodiversity, and environmental management practices to mitigate the risk of land degradation due to impacts of climate change.

The steep topography of Threlphoog chiwogs, makes it more vulnerable to negative impact of climate change, especially top soil erosion, land degradation and land slide along the farm roads. Threlphoog had experienced heavy rainfall and landslide alone the farm road during

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past monsoon, due to which the chiwog was occasionally cut of from Gewog center and local market. The isolation of chiwogs poses immense negative impact on livelihoods of the community members. Top soil erosion can signif cantly reduce the soil fertility, thus decreasing the productivity of land.

Three days CBSLM campaign was organized in Threlphoog involving 30 HHs on 17th June, 2017 coinciding the 'International Day to Combat Desertif cation, with technical backstop from Agriculture Research Development Center (ARDC), Wengkhar.

A total of 400 Napier Slips, 400 Ficus fodder, 100 wild bamboo shoots and 2000 broom grass was planted in three days. The Napier hedgerows was established in 20 acres of land and 8km along the farm road. The Napier slips were also planted in the arable land which are steep and stif y in nature.

The land management campaign will be an annual event so to keep the practice alive and reduce risk of land degradation due to climatic hazards like heavy rainfall, f ood, landslides and drought. The farmers will annually carry out the plantation of Napier slips in their f eld for slope management. Gewog Administration and RNR Agriculture and Livestock sector will be actively involved to support the farmers to carry out the activities.

CBSLM farmers group was formed comprising of 26 households (10 Female and 16 male members) under Threlphoog village to ensure successful implementation of SLM practice annually.

The event is organized by Gewog Extension Of ce with support from ARDC, NSSC, CARLEP OPM, Dzongkhag Agriculture Sector, Gewog Administration and Farmers.

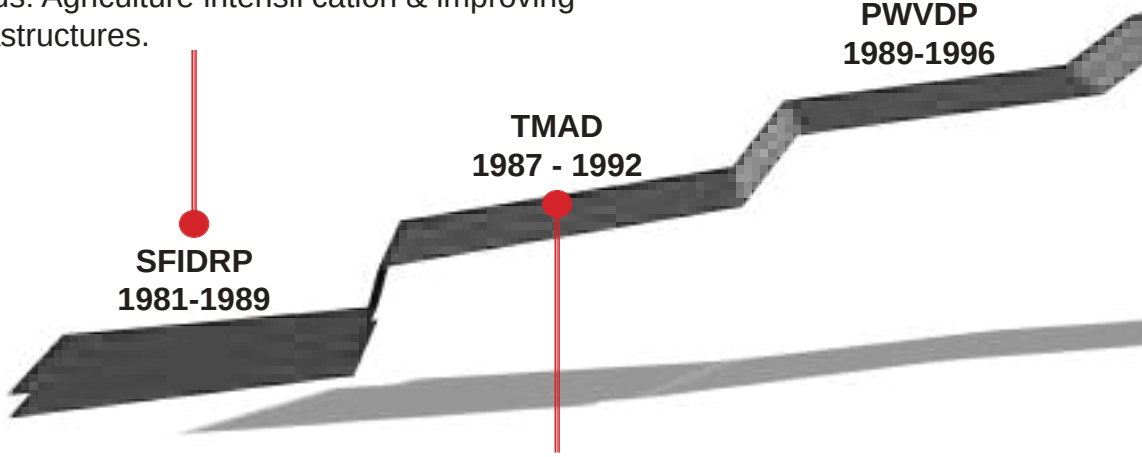
1. Gewog Agriculture Extension, Kangpara Gewog, Trashigang, MoAF

Hedge Row Plantation in Threlphoog, Kangpara

Milestone of IFAD's Projects and

Punakha-Wangdi Valley Development Project
Budget: 2.6 million US$
Benef ciaries: 3,500HHs
Area: Punakha and Wangdue
Focus: Improve agriculture and livestock production, extend rural credits, control soil erosion and village forestry, irrigation management

Small Farm Development and Irrigation Rehabilitation Project
Budget: 9.1 Million US$
Benef ciaries: 9,200HHs
Area: Thimphu, Paro, Punakha and Wangdue
Focus: Agriculture intensif cation & improving infrastructures.



Tashigang and Mongar Area Development Project
Budget: 4.8 million US$
Benef ciaries: 7,340HHs
Area: Tashigang and Mongar
Focus: introduced new farming technology, expanded extension services, improve credit deliveries.

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Programme in Bhutan Since 1981

Second Eastern Zone Agriculture Programme
Budget: 9.5 million US$
Benef ciaries: 23,000HHs
Area: 6 eastern Dzongkhags
Focus: creation of commodity-based FG's, RUG's, WUA's, Construction of farm roads, support services to extensions and rural credits and savings

CARLEP (2015-2022)

MAGIP 2011-2015

AMEPP 2006-2012

SEZAP 2000-2005

FEZAP 1992-1998

Market Access and Growth Intensif cation Project
Budget: 13.5 million US$
Benef ciaries: 5,290HHs
Area: 6 Eastern Dzongkhags
Focus: improving the productivity of subsistence-based farming systems in communities with no road access and intensifying the production and enhances smallholders' access to markets in communities with road access.

Agriculture, Marketing and Enterprise promotion Programme
Budget: 13.9million US$
Benef ciaries: 22,000HHs
Area: 6 Eastern Dzongkhags
Focus: increasing the agricultural products, market infrastructures development, construction and renovation of rural roads.

First Eastern Zone Agricultural project
Budget: 6.6 million US$
Benef ciaries: 21, 730 HHs
Area: 6 eastern Dzongkhags
Focus: develop renewable natural resources, rehabilitation of irrigation, institutional support and capacity development.

Land development in Domkhar:

A case of complimentary ef ects towards preparing for production enhancement

Phurpa Thinlay[1], Dorjee[2], Karma Wangmo and Lhap Dorji[3]

Land Development at Domkhar, Tshengkhar

Background

With the eastern region mostly dominated by sloppy agricultural f elds, both dry land and irrigated paddy f elds have limitations in realizing the benef ts of farm mechanization and commercialization. Considering the potentials from developing land by terracing drylands and expanding small terraces for irrigated paddy f elds, the MoAF has started to emphasize on land development with the aim of enhancing productivity and ef ciency mainly through use of farm machineries cutting down labor usage, cost and time taken in intercultural practices and ultimately enable commercialization of farming particularly winter vegetables after paddy cultivation.

CARLEP incorporated land development as a part of agriculture development program given the potentials in enhancing livelihoods. A total of 60 acres was targeted in six Dzongkhags with fund allocations of Nu 3.30 million in the FY2016-17.

Lhuentse Dzongkhag selected Domkhar Village under Tshengkhar Gewog where a total of 46 acres of paddy f elds owned by 37 households was developed. The area which initially was predominantly characterized by smaller terraces, stones and gullies. The land development will enable farm mechanization (using power tillers) for paddy cultivation and also for winter vegetable cultivation.

Domkhar Village – A choice based on opportunities

Domkhar village has a total of 94 households and has a total of about 120 acres paddy f elds. Land development in Domkhar began in March 2017 led by the Dzongkhag Agriculture Of ce with fund from CARLEP and farmers monetary contributions. Domkhar is a rice growing village predominantly with smaller conventional terraces and with a major irrigation channel renovated in May 2017 with total cost of Nu. 43 million from the Government of India Supports in Irrigation Development.The assured irrigation and developed land suitable for mechanization provides opportunity for

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commercialization of vegetables in the winter months. In addition, a local town on the Mongar-Lhuentse highway about an hour's drive below the village provides ready market and the village's ago-ecological conditions suitable for winter vegetable production of ers opportunities to capitalize on these multiple interventions that can result in complimentary ef ects.

Land Development - The process

A day long awareness workshop was organized by the Dzongkhag with the community. A total of 46 households came forward and agreed on both land development initiative and the post land development programs in adopting sustainable land management practices to prevent soil run of and commercial vegetable production. Monetary contributions to top up on the CARLEP support of Nu. 0.550 Million was also agreed. Dzongkhag Agriculture Sector deployed machines from Central Machinery Unit (CMU) DoA, MoAF and began the works.

With hiring cost borne by the DoA through allocation of machines to the Dzongkhag, funds from CARLEP to Dzongkhag was provided to fuel and transport machinery. The community also agreed to provide labor assistance and meals for the machine operators to enable them dedicate more time in f eld works.

Conserving the top soil – a must in land development

Land development through expansion of terraces using heavy machineries could remove the fertile top soil and could take a long time to re generate. The conservation of top soil was given proper attention by carefully removing the top soil and collecting them in a corner of the f eld. The collected top soil is then spread across the f elds uniformly after terraces expansion, thereby, maintaining the soil fertility.

Post Land development activities: Reinforcing soil fertility

In addition, the benef ciaries agreed to apply farm yard manure after land development and prior to cultivation to improve soil fertility. Sustainable land management practices of planting fodder grasses namely Napier was agreed, stone walls were built in critical areas taking advantage of abundant stone in the locality.

Benef ts of land development

Expansion of terraces promotes the use of small farm machineries such as power tillers. This initiative can enables farm mechanization by putting use of the MoAF services of gewog power tillers which is coordinated by Farm Machinery cooperation Limited.

The benef ciaries of the land development in Domkhar have found about 36% increase in the yield of the paddy in one season. For instance, farmer Wangdi harvested 900 kg of paddy from 1 langdo (langdo is equivalent to area a pair of oxe can plough in a day) in 2015. After land development in 2016, his harvest increased to 1200 kg. The increase of the productivity was also reported by other benef ciaries.

Farmers have started growing winter vegetables. A vegetable growers group was established among the benef ciaries involving 24 HHs. The group cultivated the onions in 8 acres of land. A vegetable nursery was installed to raise the saplings for cole crops. The group aims to promote the import banned vegetables like beans, chilli and caulif ower and meet the demand of the local markets in Autsho.

Developed land can also add to the aesthetic value of the site which can be even more attractive when cropped as planned. Environmentally, it can bring positive impacts through reduced soil loss, increased fertility. Economically, farmers will cut down costs of production thereby opening avenues to enhance productivity.

Risk from land development and counter measures

Land development is often associated with risk of landslide, top soil erosion and the disturbance in the natural ecology and habitats if not planned and implemented properly with counter measures. The guideline on land development by the National Soil Service Centre, DoA provides proper guidance to reduce the risks.

The case in Domkhar do not pose major risks as it involves minor earth excavation and expansion of terraces by joining smaller terraces. Appropriate structures such as stone walls, live hedgerow planting is built in the program for the critical points prone to soil erosion. A major risk foreseen is improper management irrigation water during cultivation for which existing Water User Association (WUA) members are scheduled to be reformed and trained by ARDC Wengkhar and Dzongkhag Agriculture Sector. The formation of WUA will reinforce water management and irrigation structure management.

Lessons Learned

Domkhar land development began with a careful selection of site fulfilling factors of production such as availability of irrigation water or investments and plan in ensuring sufficient irrigation water for production to begin right after the land development. Community's interest to develop land, market potentials, agro-ecological conditions suitable for commercial farming, multiple stakeholder involvement such as local governance for community mobilization and conflict resolution, engineers for technical assistance in land development, experienced machine operators and fund supports are considered that enabled a successful completion of developing about 46 acres of paddy fields now suitable for farm mechanization.

Although impact of land development may not be significant in short term realization of our national goals of rice self-sufficiency, but it does makes a good start in developing land to suit mechanization and thus commercialization. Similar models of implementation replicated across the Dzongkhag which dominated by rice farming and opening of opportunities for vegetable production after paddy will can indeed contribute towards our overall goal of domestic agriculture production of rice and vegetables.

Conclusions

The implementation of the land development at Domkhar is carefully planned taking on board potentials of complimentary effects from multiple interventions. Although, it is for paddy cultivation, a paddy – vegetable relay system can be introduced that can not only enable farm mechanization but also can put fallowed paddy field into effective utilization enhancing productivity. However, its intended objectives can only be fully realized at a later stage after few seasons. CARLEP, Dzongkhag Agriculture sector and ARDC Wengkhar will be studying the sites post land development utilization and changes arising from this.

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Protected Agriculture (PA) and Compost Production Model as option for research, development and Commercial farming enterprise: Costs and options for up scaling

Lhap Dorji, Karma Tenzin[1], Birkha B Tamang[1] and Thinlay Dorji[1]

Protected Agriculture Demostration Site at ARDC Wengkhar

Introduction

With the growing importance to enhance home production, enhance resilience to climate change, need to engage youth in farming and promote commercial farming, research and development services are responsible to provide alternative options for entrepreneurship development in farming particularly for women and youth entreprenuer.

The ARDC Wengkhar with support from CARLEP and the MoAF, promotes commercial farming in the eastern Dzongkhags with a responsibility to initiate innovative approaches in commercial farming and to provide agriculture development services and assist the implementation of the programme with thematic focus to climate change, gender, youth and commercialization.

In order to engage youth entrepreneurs in farming, initiate options in view of climate change and commercialize agriculture, the ARDC Wengkhar in 2016-17 FY began the development of “Protected Agriculture and Compost production” by f rstly developing the prototypes on station for research and demonstration purpose and then initiate promotion and up scaling of the prototypes.

These options either on its own or in combination could be promoted as options for commercialization of farming and particularly targeting youth and enterprising farmers. And with the centre currently leading the promotion of lead farmer development for wider dissemination of agriculture farming practices through changing extension approaches, these models have become handy in adding

Compost mixture if wet, should be dried before sending to sieving

Compost mixture if dry or with optimum moisture, can be sent directly sent to sieving machine

Compost dried and sent to sieving maching

Compost mixture transfered to solarisation greenhouse

Residue undecomposed materials transfer back to composting pits

Finished product packed for use or distributed

Figure 1. Composting Model at ARDC Wengkhar and Process

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alternative options in enhancing the lead farmers' demonstration model in the region.

Protected Agriculture (PA) and Bio composting: Options as a farming enterprise

Protected Agriculture is not a new innovation in farming but its practice in Bhutan is limited to only few. An innovative practice of cultivating crops under protected structures modifying the environment to achieve optimal growth, PA is widely considered to be a technology that can help to address impacts of climate change on food self-suf ciency. Considering the practice conf ned into a smaller enclosed space of the green house and the ability to have control over the crop more than conventional farming practices, it also provides a new way of farming. This perhaps could be a way forward to attract youth in Bhutan to farm in a dif erent way and promote entrepreneurship.

Bio composting is an essential component in PA which is simply recycling of farm wastes, Farm Yard Manures (FYM), soil and water through controlled decomposing. In the midst of the ef orts in promoting organic farming, compost is an important product that farmers will need to maintain a healthy soil.

The PA and Composting both results in products that can be commercialized, i.e fresh farm products of superior quality and organic fertilizer. It of ers young and innovative entrepreneur a business opppertunities, as market for fresh farm product is always available and market for organic ferterlizer is still untapped in Bhutan. Organic fertilizer can be marketed to f oriculturist and organic farmers.

PA and Composting Model at ARDC Wengkhar: Process

Established in 2016-17 with supports of the CARLEP, as a research and demonstration site for innovative approaches in farming, is currently used as a training model for the ongoing lead farmers training program, as an technology for demonstration to various farmers visiting the centre and most importantly to initiate a proper production economics study of protected agriculture and composting.

Although PA on large commercial scale is done under bigger structures, the use of currently available greenhouses can also be suitable for the semi commercial scale of farming predominant in Bhutan. Manufactured greenhouses purchased from local suppliers were established on properly developed land and f tted with proper path ways between crop cultivation beds f tted with an automated drip irrigation systems is used to grow a select few crops namely tomatoes, cucumbers, chilly, lettuce and brinjals.

The current PA model developed at Wengkhar covers an area of about 450 m^2 including exterior space is f tted with 2 nos of 5 m x 20 m poly house expanded to make a total of 3 poly houses joined by altering the space between the frames from the standard 1 m to about 3 m. This is done to expand the cultivation area and reduce cost. Manufactured drip irrigation accessories were connected to the automated irrigation system developed by the centre to run the irrigation requirements.

The Composting model is developed by transforming the existing compost yard of the Centre by providing appropriate structures for decomposing the materials, establishing a mechanized sieving

machine and a poly house to solarize or dry the compost products. Appropriate small machines such as wood chippers and chaf cutters installed help enable material preparation particularly fruit tree branches, bushes and wild grasses collected from the farm.

With abundant farm residues, poultry manures, soils and saw dust in the locality, raw materials for composting is suf ciently available, the model is currently used to prepare potting mix and compost for the ongoing research demonstration plots for vegetables and other crops maintained at the centre. A complete set up of the composting model and process is shown in Figure 1.

PA and Composting estimated Costs

Based on the establishment of the two as model for promoting commercial farming, the most important information that should be generated is the cost of establishment which is the basis for further promotion.

In order for generating cost of establishment, based on the current works, a maximum cost and a minimum cost is worked out by considering cost reduction features in the models so that a choice is available for promising entrepreneurs to decide whether to take up or not.

Promotion of PA and Composting model in the region

While detail production economics study should be taken up parallel to the use of the models for demonstration purpose, these could also be promoted in the region either the two together as a combined option for enterprise or separately. In doing so, interested entrepreneurs in farming could be taken on board to replicate these as an outreach with development support programs to support initial set up. To start with, eight lead farmers from the current batch of Lead Farmers for 2017-18 has come forward to replicate these.

The centre targets to promote these with youth farmers and a total of f ve youths responded with interest to take up these practices. More than forty credit of cials from the region visited the sites and expressed interest and support to fund any proponent coming forward to take up the practice. Currently, the centre and the Bhutan Development Bank Ltd are looking for potential clients preferably youth entrepreneurs to take these up.

The ARDC Wengkhar plans with support of CARLEP to promote these as an outreach in the beginning unless keen entrepreneurs come forward. Based on the experiences gained and having demonstrated on the potentials to enhance income through cultivation and marketing of the produces, young entrepreneurs who take up the practice could be linked to credit supports for up scaling with proper business proposals jointly developed and implemented with the research and extension providing technical assistance. In order to cut down cost, the use of local materials will be encouraged especially in the initial stages. Options for establishment of these models on a cost sharing basis right from the initial stages with benef ciary contributions either made from their savings or linking them with credit support programs is also kept open.

Conclusion

Commercial farming targeting youth may need appropriate transformation in farming practices that suit the likes of them for which PA and Composting as a business model could be an option to

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promote commercialization of farming. The promotion of PA practices can also contribute towards enhancing farmers resilience to climate change impacts and food production for which either the composting could be promoted as an supplement or separately as an enterprise on its own which current emphasis on promotion of organic farming could provide better potentials for its up scaling.

While protected agriculture practice has not gained its popularity, research and development in this practice should be initiated ad up scaled and its production economics studied and various options of crops studied. However, its promotion as an outreach could begin parallel to the research and demonstration and make a start in promoting the practice in the region.

The up scaling of these practices with depend mainly on the capacity of entrepreneurs to invest. Alternatives to cut down cost will be have to explored and wherever possible, the practices should continue to be introduced to Credit Support Agencies, projects and other development support programs for it wider adoption and promotion in the region.

1. Agriculture Supervisor, ARDC Wengkhar, Mongar

Automatic Drip Irrigation System installed in PA Demostration Site in ARDC, Wengkhar

Lead Farmer Model and Expansion as an extension approach

Lhap Dorji, Tashi Phunstho[1], Dorjee[2] and Pema Khandu[3]

First batch of Lead Farmers trained by ARDC Wengkhar under CARLEP

Introduction

A lead farmer model in the implementation of the CARLEP was developed based on the experiences of the centre in the implementation of past development support programs in horticulture mainly from the Technical Cooperation Projects with JICA supports was ref ned and adjusted to the objectives of the implementation of CARLEP. The lead farmer model is composed of mainly hands on training and expansion of the model through establishment of model farms where the lead farmer can demonstrate the skills from the trainings attended as a part of the program. The components of the model are based on integrating vegetable cultivation with other suitable crops, adoption of production and post-harvest practices including processing, book keeping and value addition taking into consideration the multiple skills and practices the lead farmer is to demonstrate in expanding the model.

Accordingly, a proper course manual encompassing the components were developed prior to the training through review of past training materials and f ne tuning with the needs in the implementation of CARLEP. An outline of the course and the training cycle is shown in Figure 1.

In order to encourage and enhance capacity of the various partner agencies of the MoAF, resource persons for the training were mobilized from ARDC Wengkhar and the central program agencies such as National Plant Protection Centre (NPPC), National Organic Program (NOP), National Soil Service Centre (NSSC), National Post Harvest Centre (NPHC) and the Regional Agriculture Marketing and Cooperative Of ce (RAMCO).

By the end of the f rst year of implementation of CARLEP, total of 26 lead farmers (4 Women and 22 Men) have completed the training. In order to ensure gradual take over by the Dzongkhags in deployment and utilization of the lead farmers and the models, the graduating lead farmers were of cially handed over to the Dzongkhags

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with clear roles and responsibilities in presence of one of the District Administrators (Dzongdag).

Expansion of lead farmer model

Establishment of lead farmer demonstration models

Each of the lead farmers with project supports were provided with a set of basic tools such as secateurs and saw along with planting materials of vegetable seeds, cereal crops seeds and fruit saplings to establish demonstration models. These demonstration farms are established for the lead farmers for direct application of training skills and demonstrate their farm management skills to others. In addition, these are also established for the gewog extension center to organize training of other farmers using the lead farmer as resource person in the subsequent years of the project thereby expanding the lead farmer model and promote farmer to farmer extension.

With the establishment of lead farmer demonstration models, a total of 6.17acres of land (Average size of model of about 0.25 acres per lead farmer) was converted to an integrated fruits, vegetables and cereal crops cultivation thereby putting in place a consistent source of income for lead farmers and a place for the lead farmers to demonstrate skills to others.

Gewog extension centre begin use of Farmer to Farmer Extension methods

In order to initiate expansion of lead farmer model, ARDC Wengkhar prior to starting the f rst batch of lead farmers has selected and re trained a group of farmers from past batches for Dzongkhags and Gewogs to start using their services in promoting farmer to farmer extension thereby expanding the lead farmer services.

Although no formal expansion of services was reported during the year, a follow up with Dzongkhag and Gewogs show that farmer to farmer extension approaches using the lead farmers and as well as any other lead farmers have taken place in several gewogs. As of now, at least one to two cases of farmer to farmer extension is reported from the Dzongkhags mainly deploying trained lead farmers as well as other progressive farmers in vegetable cultivation practices, nursery management, plant propagation and crop intensif cation.

A Youth Lead farmer begins to lead others in Minji even before completing the course

A group of 22 youth (18 Women and 4 Men) in Gulibi, Minji Gewog of Lhuentse led by one of the Lead Farmers from the f rst Batch, Gaydhuen Jamtsho has started commercial cultivation in a total area of 15 acres provided under the Use Right Certif cate Scheme on a pilot basis.

While their main commercial activity is on vegetable production which began some times in October 2017 onwards to target vegetable production in December to March, the group with technical assistance of ARDC Wengkhar, Dzongkhag and gewog extension centre began cultivation of chilly, upland rice, soya bean, asparagus and passion fruits since July 2017 led by the group leader who is one of the lead farmers who recently completed his course.

In order to expose members of the group on commercial farming practices, the lead farmer with support of Dzongkhag and ARDC Wengkhar organized an exposure visit to ARDC Wengkhar and Lingmethang earlier this year in May 2017.Field days and farm production planning exercises

and trainings were also conducted by the center, gewog and the Regional Agriculture Marketing and Cooperative Office.

The group leader is assisted and Assistant Group Leader and two treasurers appointed among themselves. A proper terms and conditions, roles and responsibilities were framed with TA of the RAMCO, MoAF and the gewog extension. The group harvested chilly, upland rice and soybean so far and is currently expanding their vegetable cultivation.

Expansion of lead farmer model by Samdrup Jongkhar Initiative (SJI)

The Samdrup Jongkhar Initiative, an NGO operating in Samdrup Jongkhar has adopted the lead farmer model by taking up one of the former model farmers trained and established by ARDC Wengkhar and deployed his services in training and developing other lead farmers in their program areas especially in Gomdar, Orong and Dewathang.

SJI became a partner agency in the implementation of the lead farmer model and thus led the lead farmer expansion in Samdrup Jongkhar Dzongkhag, where the NGO operates. Separate fund supports were provided to SJI in implementing the approach.

In the 2016-17, a total of 8 prospective lead farmers (6M and 2F) were identified by SJI from Dewathang, Gomdar and Orong and were trained by our lead farmer MC Gurung from Orong and SJI mainly on soil and land management, vegetable cultivation and bio pesticide preparation, seed storage and production, revival of traditional cereals, crop intensification, cropping calendar, financial literacy and Nutritional improvements.

Soya bean cultivation by Youth engagement in farming, Gulibi Lhuenste

A study trip for the prospective lead farmers to ARDC Wengkhar, Lingmethang and some of the farmer's field in Mongar was also organized by SJI to reinforce training

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and observation in demonstration farms of the lead farmer.

Subsequent to the training of prospective lead farmers, they began expanding their skills by organizing a plantation program coinciding with the Social Forestry Day on June 2nd 2017 at Dewathang in which about 200 other farmers took part. Another event on expansion of lead farmers services in which prospective lead farmers from Bangtsho, Rekhey, Domphu, Brongteri and Menchari had exchange visits to individual farms to check progress on their farm activities. A total of 8 sites were visited benef ting 141 other farmers from the awareness programs in farming provided by the prospective lead farmers. SJI continue to be partner to the implementation of lead farmer approach and are supported through the CARLEP-IFAD.

Conclusion

Learning from each other through demonstration, observation and application are key features of the lead farmer approach in agriculture extension that the implementation of CARLEP has adopted in order to contribute towards expanding extension services in the region. Given its salient features in shared learning from each other with lessons arising from real life applications of farmers themselves, CARLEP implementation will continue to deploy the approach and bring about a change in the extension approaches. And for the technology and service delivery from extension centers, this can come as a helping hand the limited extension personals in the gewog extension centers. The success of which greatly will depend on the utilization of the services of the lead farmers by the Dzongkhag and gewog extension.

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Roles of Women in Vegetable Value Chain in the East

Karma Wangmo and Sangay Choeda

A youth farmer harvesting chilli, Minjay, Lhuntse

Background

Women in Bhutan continue to play a major role in agricultural development along the value chain starting from production at farm through the post-harvest management and processing to the market or consumers. The post-harvest and processing of the farm produce are done by 73.5% of women compared to 26.5% of men in the east. Further, the percentage of women and men as members of vegetable groups is 63% and 37% respectively.

These figures indicates that women are actually one of the main actors in the vegetable value chain, leading in the marketing of agriculture produce to increase the household income and value chain development as a whole.

CARLEP which is thus institutionalized to further strengthen the capacities and the contributions of the woman farmers in the vegetable value chain aims to cover 50% of women participation in all the programme's activities.

Women beneficiaries in CARLEP

Realizing the roles of the rural women who are actually multi-tasking along the value chains from the field to market, in their own enterprises, in family activities and as employees though much of their time is taken for home-based non-farm activities like care economy, the Gender mainstreaming and the social inclusion guideline was formulated to reiterate gender differences analysis and look to ensure men and women alike equally participate.

Interestingly, in the 2016-17 FY alone, of

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the total of 33,011 total benef ciaries of the programme, 15,659 were women. A total of 5,550 women were supported in the vegetable productions; 4,518 of them were supported with vegetable seeds, 869 trained on vegetable productions and another 163 women received other inputs for the vegetable production. Additionally, the programme also supported 256 women with potato seeds.

Similarly, of the 8 new vegetable marketing groups formed by RAMCO, the total number of women participants was 104 while the men participants was 23. This f gure indicates that women in the east are adequately equipped and engaged in the whole process of vegetable value chain.

Opportunities for further support to women by IFAD

Land preparation

The emergence of gender-friendly farm machineries like mini-power tillers and new applicable technologies under vegetable farming has only encouraged women to part take in activities which in the past were only meant for men. The usage of mini-power tillers in land preparation and management by women is one such prominent features that underpins the notion. In order to further cement the involvement of women in the agricultural development IFAD and other women agencies should focus on promoting farm mechanization with the introduction of new and improved workload minimizing technologies.

Production

The programme supports through three major components, viz. production intensif cation, marketing and institutional strengthening. Women have been through all levels pro-actively involved although their level of inf uence is minimal. In order to enhance women capacity under value chain operation, they should be involved in all stages of the value chain (AMJ Business Research and Consultancy, 2014). Any seed sowing, be it for the kitchen garden or for the commercial farm, it is mostly the women who do it. The weeding and transplanting of the vegetables are mostly taken care by women. IFAD programme has been funding the trainings of vegetable production and handling techniques and should also weigh options to train the farmers comprising of only women to avoid being suppressed by their male counterparts enabling them to voice out issues from women's perspective when it comes to production and value chain as a whole.

Harvest and Post-harvest management

Vegetable harvesting is usually seen as a non-tedious that should be taken care by women. By the virtue of 65.2% of women in the East are engaged in on-farm activities, the majority of works related to harvesting, thinning and managing the vegetables is done by women. Regarding the packaging and transporting of the perishable vegetables that need to get to the market within a short period, the women are helped by men especially when coming to the transportation. The Comprehensive Gender Study conducted by AMJ Business Research and Consultancy, 2014, found out that the percentage of women working on post-harvest processing activities is 73.5%, whereas the percentage of men working on post-harvest processing activities is only 26.5%.

In general, especially back in the villages, women are often considered to the prime group to do the value addition of the products like drying, pickling, chip

Women participating in potato seed varieties selection at Khangma, Trashigang

processing, packaging and storing. With necessary support in small post-harvest equipment, their engagement in the value chain can only escalate.

Marketing the vegetables

"In agriculture, most of the light works after plowing is done by a female as they do not go out to do paid works." (Male FGD, Kanglung, 2013). Marketing of the vegetable is also seen as a light work, which is most of the time done by the women. Both the decisions and keeping the money from the sale of vegetables are dealt by the women. "Women have more access to and control over all the vegetables relating to making the decision to sell, f xing prices and keeping the money." (AMJ Business Research and Consultancy, 2014). The establishment of contiguous collection centers or sheds and sale-counters can be one of many pulling factors encouraging more participation form women in vegetable value chain. The institution of farm shops is also seen as an opportunity for easing the women's marketing job.

Participation in vegetable groups and availing of agriculture services

The assessment conducted by RAMCO on the registered Farmers' Groups and Cooperatives in 2016 found out that Eastern Dzongkhags alone has a total of 151 Farmer Groups, of which, 65 are the agriculture Groups. Similarly, the comprehensive Gender study conducted by AMJ Business Research and Consultancy has reported that the percentage of women and men in the vegetable group is 63% and 37% respectively. The same study has also reported that the 'women' are the main person from the households who attend the agriculture demonstrations and avail most of the agriculture extension services.

Thus, in apparent, it is women farmers who acquire more knowledge, skills and the information on vegetables including the demand trends in the market, thereby, standing as one of the major actors in the vegetable value chains.

Challenges faced by women in vegetable value chains

Despite holding a very important

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contribution towards the vegetable value chains by the women farmers, they are still bounded with the string of challenges and often burdened by the households; the works which are not paid. They perform various home-based activities related to care economy, community roles and for growing food for home consumption. “It is been observed that most of the training is attended by the female as male go out for the paid works, however, credit is mostly handled by male though agricultural work is done by female more.” (Yangnyer RNR, 2013).

Similarly, the percentage of women in the vegetable groups is 63%, the percentage of women in a leadership position is very low. The Comprehensive Gender Study reports that the percentage of women chairperson is 34.6%, women secretaries of 50% and the women treasurer is 0%. The same study also reveals that major constraints faced by the women in vegetable productions are; invasion of pests and diseases, wildlife encroachment, limited local markets, lack of processing equipment and storage facilities among others.

Recommendations

1. Women are actively involved in the land preparation due to the emergence of the gender-friendly farm machinery. However, the extent of the gender-friendly machinery is almost insignif cant in the current trend. Therefore, CARLEP as a major agricultural development f nancing Programme in the East still has to explore and f ll up the gap.

2. Women are often bogged down with the Household chores and the care economy; the works which are not paid and valued. These unpaid works compromise their times and ef orts for other income-generating works. This issue of the ‘Unpaid works done by women’ need to be considered to empower the women in the vegetable value chains.

3. Rotting of the perishable vegetable items in the absence of proper storage facilities results in the post-harvest losses. This indirectly impedes women farmers towards Commercial scale production. Moreover, the limited markets discourage women farmers to actively contribute to the value chain activities. Therefore, RAMCO and FCBL under the CARLEP’s support still has the milestone to cross in bridging the gap.

4. The leadership position of women in the Farmers’ Groups is rising. But it is still low. Under CARLEP, more women need to be empowered and encouraged to take up the leadership positions.

5. Both women and men are considered equally in all the decision making and other services. However, the requirement of a woman dif ers from man. The same activity af ects the woman and man dif erently. Therefore, a closer look at the underlying gender gaps needs to be done.

6. More Groups can be comprising of only women members.

Conclusion

Women farmers plays an active and vital role in the vegetable value chains; of reaching the products to the end consumers. To further facilitate their roles, the farmers still need to be educated, trained, advocated especially to be in the inf uential and decision making positions. The gender-friendly farm machinery, post-harvest equipment, better storage facilities and other new and improved techs still need to be explored and promoted in the interest of the women farmers.

Women-led Yoekhar Vegetable Production and Marketing Group

Karma Wangmo and Kencho Pelden[1]

A farmer sowing Peas

Rationale

Of the total of 164 Farmers' Groups registered with the RAMCO (Regional Agricultural and Marketing Cooperative Of ce, Mongar) as of June, 2016, only 17 FG's are women-headed with one or no male member in the group. The 'Group assessment survey' conducted by RAMCO in 2016 found out the male member is 9% higher than the women membership in the registered Groups. This f gure indicates that the women involved in the leadership positions and the involvement in FGs are slightly less than men.

However, there are few successful cases of FGs led by women members like the 'Yoekhar vegetable production and marketing Group' of Yadhi in Ngatshang under Mongar Dzongkhag.

Yoekhar falls under the vegetable commercial site of CARLEP because of its relative accessibility to roads and higher production potential for the growth of both summer and winter vegetables. The village is located close to Yadhi Central School and along the Mongar-Trashigang National highway which ensures the farmers with secured markets.

Background

This Yoekhar 'Vegetable production and Marketing Group' was f rst formed in 2013 under the facilitation of the Gewog Agriculture Extension Of cer (GAEO) after the members confronted their willingness to form the group.

The Group has 12 members with 11 female and 1 male. All the three executive members (Chairperson, Secretary and Treasurer) of the group are women. In

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2016, the group got formally registered with RAMCO. The group gathers twice a year under the leadership of the GAEO to revisit their bylaws and deliberate all the matters associated with the group.

The group grows all kind of seasonal vegetables like cabbage, caulif ower, broccoli, chili, brinjal, spinach, ginger, peas, beans, carrot, potato and pumpkin. They market most of their products to Yadhi Central School after they signed the contract with the school through 'Farmer school linkage 'in 2014. In the case of the excess or the surplus production, they sell their products to the local consumers in the Yadhi market.

In the 2014-15FY, each member of the group received a bundle of elastic watering pipes, sprinklers, electric dryers and the potato chips making a machine from MAGIP. The executive members also received a book-keeping training.

Production and the income status

According to the production record of GAEO, this women-led Yoekhar Vegetable Production and Marketing Group has produced 14730.5 kilograms of vegetable in the year 2016 excluding the 25% of the total harvest which was used for the home consumption and other domestic purposes like gifting to the close ones.

The members revealed that they earn a minimum of Nu.1500/- from one time supply to the school. The group gets to supply the vegetables to the school once in three weeks, which is on an alternative basis with two other vegetable groups from the same village.

The members collect their money at the end of a month after depositing 5% of the total amount in the Group saving the account. The group members also revealed that, in three years, they have saved around Nu. 26, 7200/- in their common saving account.

According to some of the group members, the formation of the FGs has helped them to earn more cash income and reduced the need to do the of -farm labors.

Group strength

Yoekhar Vegetable Production and Marketing Group is one example of a successful FGs led by women members. All the group members are the enthusiast vegetable growers. The members received a greenhouse, watering pipes, sprayers, electric dryers and potato chips machine from MAGIP-IFAD, which further motivated the farmers to upscale their production potential and production areas.

Moreover, the executive members of the group received a 'bookkeeping' training from MAGIP which enriched them to maintain the proper record of the investment, income, production and the time frame. This record has facilitated the accountability and transparency for ef ective group mobilization.

In addition, apart from supplying the vegetables to the school, the members are taking their vegetables to the local market. According to the Group's chairperson, they take 25% of the total production in the local market on a home delivery services. Such home delivery services avoided the risk of the limited market and also post-harvest losses.

Challenges

Despite that the group is formed and led by women members whose potential in labor force especially in the manual works is considered to have less impact, the

group reports that they haven't faced any challenges even for any physical/manual works.

The group gets an equal access to all the input capitals such as land, water, market and other social assets like any other groups. The three executive members mobilize the group with fair accountancy and transparency.

However, there are some underlying issues faced by the members like rotting of the most perishable vegetables like tomatoes in summer and the water shortages in winter. Some members revealed that they are facing market competition from other groups.

Recommendations

• Explore for adequate water source- to curb down the inadequate water supply which then limits the production potential, the group can explore for some reliable water source, aiming for the water harvesting mechanisms like a reservoir tank or rain-water harvesting.

• Provision of the water-proof net during rainy seasons- a considerable amount of the harvest is lost in the rainy seasons due to rotting and decaying. The provision of waterproof net especially during the rainy seasons will minimize the losses through decaying.

• Focus on the of -season vegetables - the group has the plan to procure some more greenhouses which mean they can also concentrate on doing the of -season vegetables with the input and technical support from the Gewogs and the Dzongkhags.

• Explore on the post-harvest diversif cation- the group has the potential to explore on the post-harvest diversif cation like drying the vegetables, pickling, jamming, juicing etc.

• In order to withstand the competition from other groups, Yoekhar Vegetable Production and Marketing Group can promote the of -season vegetable varieties and on the varieties that are not cultivated by other groups like focusing on the improved/hybrid vegetable varieties.

1. Gewog Agriculture Extension, Ngatshang Gewog, Mongar, MoAF

A woman farmer weeeding in Mustard Field

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Irrigation support helped revival of fallow land in Tsakaling

Sonam Dolkar[1] and Ugyen Wangdi[2]

Paddy Fields of Tsakaling

CARLEP's support in irrigation renovation focuses on major dysfunctional canals considering all the climate aspects, area and number of households to be benef ted. It was also focused on the area that is potential for commercialization of vegetable.

The of 18.26 acres of wetland in Sherong (16.63 acres) and Binser (10.26 acres) under Tsakaling Gewogs has been left fellow for more than a decade due to insuf cient irrigation water and human-wildlife conf ict. Although, the Dzongkhag renovated the cannel through fund from RGoB in 2010, the farm road construction in the 2011 damaged the renovated canal. Dzongkhag had also managed electric fencing in 2015 with funds from the EU-GCCA (European Union – Global Climate Change Alliance Project) and technical support from ARDC Wengkhar, but could not managed to bring all the area under cultivation due to water shortage. Although some farmers used to cultivate small scale vegetable for self-consumption, the community could not be materialized in putting all the land into cultivation despite having electric fence.

In the f nancial year 2016-17, CARLEP supported the renovation of Binser and Sherong irrigation schemes. With the completion of 2.26 kilometers irrigation renovation that was constructed considering all the climate aspects, 18.26 acres of wetland belonging to 41 households (24 in Binser and 17 in Sherong) were revived. The land is now fully under paddy cultivation, enhancing the households' food security and rice self-suf ciency. The program was supported under Resilient and water use ef cient irrigation development at a total cost Nu. 4.476 million under CARLEP/ IFAD program.

With availability of irrigation water in winter, winter vegetable production is possible now. Therefore, Dzongkhag Agriculture Sector with Gewog Extension Of ce is planning for commercial vegetable production after paddy harvest.

1. Gewog Agriculture Extension, Tsakaling Gewog, Mongar, MoAF 2. Component Manager, Agriculture, OPM

Institutionalizing the Online Reporting System in CARLEP

Karma Wangmo and Sangay Choda

Introduction

CARLEP implementation is built on the lessons learned and the achievements of the past IFAD projects and programmes in Bhutan. One of the most important lessons was the inconsistence in progress reporting system.

The conventional method of Annual Progress Reporting was done manually. The implementer's record and store data in separate excel sheet, and later submit through post or email. In the process, maintaining uniform format was a challenge as some implementers adopt their own reporting format to suit the needs of various programmes. Thus, systematic analysis of the data was dif cult. It was also tedious and time-consuming. Further, many lessons and experiences were not captured or remained undocumented which has been associated to poor progress reporting system and the absence of proper information repository.

Therefore, Of ce of the Programme Management (OPM), CARLEP developed an 'Online Reporting System' (ORS) using Google sheet for Annual Progress reporting and monitoring of the f eld activities.

Online Reporting System (ORS)

The Google Sheet is a free web-based of ce suit of ered by Google that allows users to create, update and modify spreadsheets and share the data live online. It enables authorized users with the right to edit, comment and view the protected f les. It enables multiple, geographically dispersed users to collaborate on a spreadsheet in real time from any devices.

Following are some of the advantages of Google sheet:

• Accessible from any devices with reliable internet connection

• Allows user-specif c access for right to enter or remove data

• Enable real-time collaboration between multiple users

• Ability to create live database

• Allows creating GPS based data maps.

Institutionalizing ORS: Process

In August 2016, after initial development of the ORS, the team from OPM visited some of the implementing agencies to familiarize the system and to incorporate their feedbacks and suggestions.

Similarly, two rounds of hands-on training on use of ORS was given to the sector heads of the six Programme Dzongkhags and the representatives of the three central agencies (ARDC, RLDC and RAMCO) in December, 2016 and July 2017.

A step-by-step guide to use the online sheet is also made available in CARLEP's website (http://www.carlep.gov.bt/?page_id=182)

The system was further improved upon review by IFAD's Implementation Support Mission (ISM) to CARLEP in March 2017.

Benef ts

i) Increased ef ectiveness of reporting

Since, ORS uses real-time Google Sheet it allows the M&EO and component managers at OPM to trace the progress update and take instant course corrective

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measures in case of any errors or inconsistencies in data through phone calls or other means of communication. This ensures high quality data and also reduces the reporting time.

ii) Automatic data compilation

The ORS has linked all the implementer- specif c f les into one common f le that automatically consolidates the data.

Dzongkhag Sector Heads introduced to ORS by OPM

iii) Increased accuracy.

The accuracy of the information is ensured in ORS as it permits the cross-checking of the data in real-time basis. In addition, the data to be entered are specif ed by the units, so, it is easy to trace any error and other missing information.

iv) Secure and reliable storage

ORS uses Google drive which of er secure and reliable storage services. Information stored online is available from any device with access right permission. The data is also manually backup in hard disk and computer. So, the risk of loss of data is minimized.

v) Increased transparency and accountability

Since all the details of each activity including the target, fund and outputs are available online, the accountability and transparency of the Programme could be enhanced.

Lessons learned

The ORS is convenient and ef cient way of monitoring and evaluation system, and can be adopted by any performance-based funding programme like CARLEP. It is quick and easy to track progress of the programme.

The Agriculture sector of Trashigang Dzongkhag has already replicated the practice of Online reporting towards July, 2017. The sector is now using the online format similar to the CARLEP to get the update from the Agriculture focal person working in the Dzongkhag.

Conclusion

The introduction and institutionalization of ORS with the use of a Google Sheet has contributed towards a robust M&E framework.

The system is cost-ef ective, ef cient and user-friendly and can be replicated with minimal cost implication, provided there is a reliable internet connection.

Reporting Online is very ef cient in data transferring, information sharing and analyzing data. There is minimal risk of data loss and it is easier to trace errors for correction. In addition, the online reporting system is user-friendly. Anybody who owns a Google account can use the ORS from any devices with access right permission.

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