



**Assessment of Lead Farmers Training Model being promoted under
CARLEP in four Dzongkhags of Eastern Bhutan**

Kinga Chozum

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Royal University of Bhutan

College of Natural Resources

Lobesa: Punakha

BHUTAN

Declaration

I hereby declare that this project titled **“Assessment of Lead Farmers Training Model being promoted under Commercial Agriculture and Livelihood Enhancement Programme (CARLEP) in four districts of Eastern region”** is an original research work done by me and I have not committed, as far as to my knowledge, any academic dishonesty or remedied to plagiarism in writing the research paper. All the information sources, technical feedbacks, supports and assistance received during the course of the study are duly acknowledged.

Student’s signature.....

Date: 7/08/2019

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Abstract

The lead farmer training was introduced by Agriculture Research and Development Centre (ARDC) supported by Commercial Agriculture Resilient and Livelihood Enhancement Program (CARLEP) in 2015. This paper explores the impact of lead farmer training on production and income of lead farmers and extended farmers. Though training started in 2015 there were no assessment made on its impact. The objectives were i) to identify the factors that motivated farmers to participate in lead farmers training, ii) to assess the impact of training on income and production of vegetables in the communities of Tashigang, Tashiyangtse, Mongar and Lhuentse Dzongkhags, iii) to determine challenges faced as a lead farmer and support required for effective extension of knowledge and services. Data were collected using semi-structured questionnaires from 41 lead farmers and 49 extended farmers from four Dzongkhags of Bhutan mentioned above. T test was conducted to see significant difference before and after training for income and vegetable production. The findings showed that factors like gaining knowledge motivated them to become a lead farmer. It also showed that lead farmers training has improved their vegetable production and income. There was significant difference in production of vegetables before and after lead farmers training of Mongar, Tashigang and Tashiyangtse Dzongkhag (<0.05). Similarly, income is differed significantly before and after lead farmers training in Tashiyangtse and Mongar Dzongkhags (<0.05). There was significant difference in production of vegetables and income of lead farmers before and after the training in Tashiyangtse and Lhuentse Dzongkhags (<0.05). Though this type of training's were beneficial for both the lead farmers and extended farmers, the lead farmers still faced lots of challenges while delivering their services like support from farmers, budget and marketing of the products. The findings also indicated that the lead farmers needed support from the farmers and budget for enhancing their extensions.

Key words: Extension officer, Farmer-to-Farmer Extension, Lead Farmer, Lead Farmer Training

Abbreviations and Acronyms

ARDC	Agriculture Research Development Centre
(Birr, Br)	Ethiopian currency
CARLEP	Commercial Agriculture Resilient and Livelihood Enhancement Program
Dzongkhag	District
F2F	Farmer-to-Farmer
FAO	Food and Agriculture Organization
Gewogs	Village blocks
Gup	Block head
IFAD	International Fund for Agricultural Development
LF	Lead Farmer
MoAF	Ministry of Agriculture and Forests
(Ngultrum, Nu)	Bhutanese currency

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CHAPTER ONE

INTRODUCTION

1.1 Background

In most developing countries, smallholder farmers have insufficient opportunities to learn about new technologies and improve agricultural methods (Gale et al., 2013). About 50-80% of the households are dependent on agricultural employment in developing nations. The majority of them are poor and illiterate. The main challenges they face are to provide information and new interventions to the farmers without many expenses. There is also need to identify ways of going beyond simple message delivery to finding ways of making farmers the principal agents of change in their own communities (Lukuyu et al., 2012).

Farmers selected to become lead farmers in farmer-to-farmer extension efforts are often called model, master or lead farmers, and are chosen based on their agricultural expertise. In other initiatives, they are called farmer promoters or trainers, emphasizing their networking or training skills (Kundhlande, Franzel, Simpson & Gausi, 2014). According to Kiptot (2014), farmers learn best from their fellow mates than the extension agents.

Farmers' trainings initially started from May 2004 in Lobesa with five instructors in Bhutan. The majority (59%) of farmers in Bhutan are smallholders depending on subsistence farming. The agriculture extension service is provided mainly through Dzongkhag and Gewog Extension Centres. The extension system is gradually transforming from the conventional role of extension staff as an input supplier to more of a facilitator. However, with just one Agriculture Extension staff in the Gewog Agriculture Centres, coverage and service delivery has been the concern due to rugged terrain and scattered settlement coupled with limited resources supporting agriculture extension activities. So, farmers are trained as lead farmers and sent to train other farmers.

Commercial Agriculture and Resilient Livelihoods Enhancement Programme (2015-2022) builds on prior and on-going IFAD-funded interventions focused on increased agricultural production. This intervention is taking place on marketing and climate resilient farming practices in gewogs of six districts of eastern Bhutan. They are Tashigang, Tashiyangtse, Lhuentse, Mongar, Samdrup Jongkhar and Pemagatshel. Lead farmer training is an initiative undertaken CARLEP in order to help the people of the Eastern Dzongkhags. This training began from 2015 and is still an ongoing practice. Farmers are selected from different districts of the eastern region according to the criteria set by Agriculture Research and Development Center (ARDC) and they attend a lead farmer module course, in

Wengkhar, Mongar to help the farmers of the regions. After the completion of course they are certified as lead farmers who needs to extend their knowledge to at least five other farmers. The main objective of the training was to help people introduce to new technology and make new rules and policies which are helping the farmers do better agriculture or agribusiness. Although trainings have been carried out, there was no review or assessment of how effective the training was and what were the challenges and issues faced in order to disseminate the information learned.

1.3 Objectives

- To identify the factors that motivated farmers to participate in Lead Farmers Training.
- To assess the impact of training on income and production of vegetables in the communities of Tashigang, Tashiyangtse, Mongar and Lhuentse districts
- To determine some of the challenges and opportunities faced by lead farmers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Lead farmer

According to the Government of Malawi (2010), a lead farmer is characterized as an agriculturist who has been chosen by the community to perform technology-specific farmer-to-farmer expansion and is prepared to utilize the innovations. Someone who motivates other farmers to try new technologies is a lead farmer. Must always lead by example by practising what they are taught on their own fields. They are farmer chosen by other farmers to represent them in agricultural development and train them to use new technologies.

2.2 Lead farmer selection

Farmers learn best from their peers, or those of slightly higher social, and it makes sense that the fellow farmers that a lead farmer serves should select the lead farmer. Majority of the lead farmers are selected by their groups or communities. Increasing the role of the community in selecting and monitoring lead farmers is important for promoting effectiveness and sustainability status (Feder & Savastano, 2006).

2.3 Farmer to farmer extension

One vital factor that influences the capacity of an organization to carry out and perform compelling expansion exercises is the measure of specialized and administration ability of the expansion staff (Masangano & Mthinda, 2012). Garforth (2011) noted that universally, most inquire about on agriculturists to get idea on modern innovation.

The farmer to farmer approach reacts to farmers' needs for data on inputs and innovations through lead farmers. Information are shared through encounter with other farmers and test are conducted in their fields (Hird-Younger & Simpson, 2013). Farmer to farmer extension may be a reasonable strategy of innovation spread based on the conviction that agriculturist spread advancement among peers more productively than outside expansion operators (Kipot & Franzel, 2014). According to Bentley et al. (2013) farmers are able to learn and understand more when they are taught by their peers instead of the external extension agents.

2.4 Benefits of lead farmer

Mulwafu and Krishnankutty (2012) noted that the lead farmer approach had numerous benefits. They noted that the lead farmers provide a focal point in the community for introducing new technologies, for building farmer capacity, and as an entry point for service providers, such as input suppliers. Farmer trainers also help increase farmers' networking and linkages in the communities and enhance the exchange of knowledge and sharing of experiences for increasing agricultural production.

Lead farmers help in changing attitudes of the farmers, who motivate and encourage one another in adopting technologies. Because of trust, closeness and shared common attributes, farmers tend to be inclined to learn from fellow farmers. Lead farmers also serve as an entry point for other development initiatives.

2.5 Benefits of farmer to farmer extension

Farmer to farmer extension approach can enable farmers to make better decisions better and provide feedback to researchers and policymakers so that they can improve (Kiptot et al., 2006). The F2F approach seems particularly pertinent for broadcasting innovations to farmers and improving their livelihoods, yet few studies have been carried out on this method of extension and advisory service, and none have examined the use of the approach across organizations and between countries (Lukuyu et al., 2012).

Currently, such programs are widespread. In Malawi, for example, a survey of 37 major extension providers found that 78 percent used some form of F2F extension (Masangano & Mthinda, 2012). Erbaugh et al. (2010) proposed that appraisals are required to assess, adjust and make strides their viability. Davis (2004), Place et al. (2002) and String fellow et al. (1997) recommended that it is imperative to back agriculturist organizations as a major vehicle for farmers advancement. Prasad (1994) has advocated that for transfer of technology and improving human skills regarding developmental process training is an important mechanism. To ensure agriculture development present institutes needs to be strengthened with well-planned system of training (Pandey et al., 1993).

2.6 Challenges faced by lead farmers

According to Akinnagbe and Ajayi (2010), having poor resource and less well-educated farmers is the main challenge as a lead farmer. According to Amanuel (2007) many farmers of Ethiopia are not able to carry out their experiments because of the risk of exploitation of their scarce resource. Another challenge in farmer led extension service is that the lead farmers should be accepted by their fellow farmers and support them so that extension is smooth and effective (Akinnagbe & Ajayi, 2010).

2.7 Motivating factors to attend trainings

According to Mwamakimbula (2014), Of the farmers interviewed, 14.2% (n = 17) indicated that the desire to get new knowledge and techniques to apply in their fields motivated them to attend training programs whereas 17.5% (n = 21) of the participants reported that wanting to know about the effective use of proper inputs in their fields was what forced them to attend training programs in their respective areas.

CHAPTER THREE

METHODOLOGY

3.1 Study area

There are six eastern Dzongkhags in Bhutan namely, Tashigang, Tashiyangtse, Mongar, Samdrup Jongkhar, Lhuentse and Pemagatshel. CARLEP is focused on those six Dzongkhags because of its vulnerability to climate change and for improving the production and its marketing. In six Dzongkhags there are 79 lead farmers from 49 gewogs who were handed over to the respective Dzongkhags from 2015 to 2018. Out of the six Dzongkhags, four Dzongkhags (Tashigang, Tashiyangtse, Mongar, Lhuentse) were selected for the study due to its convenience. Tashigang has altitude ranging from 500meter to 4500meter above the sea level with annual rainfall between 1000mm and 2000mm. Tashiyangtse is located at an elevation of 1750 to 1880 meters above the sea level and about 2749mm rain falls annually. Mongar has an elevation of 1600 meters with annual rainfall of 2444mm. Lhuentse has elevation of 1535 meters with annual rainfall between 1000mm and 1500mm.

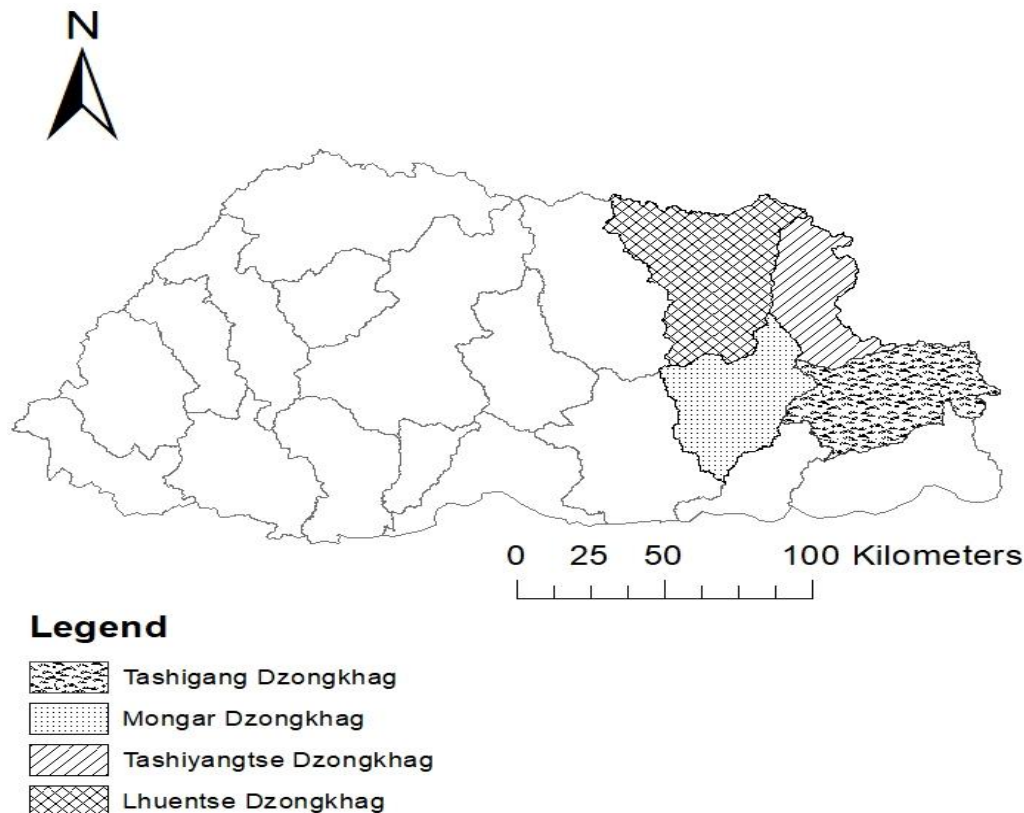


Figure 3.1: Four Dzongkhags (Tashigang, Tashiyangtse, Lhuentse, Mongar) of study.

3.2 Sample size

Initially, all 59 lead farmers were attempted for this study (census). However only 41 lead farmers participated in the survey. Despite repeated attempts, it was not possible to meet them. Accordingly, the response rate was 69.49% which is acceptable in social science.

Likewise, 250 extended farmers were attempted for the study but due to i) transfer from the village, ii) not able to extend due to other commitments, iii) became inactive after training, only 49 extended farmers could participate in the survey.

3.3 Data collection

3.3.1 Data collection

Data were collected using a tool known as Ko Bo Collect Toolbox, a software where we take up the questions in soft copy and collect the information through devices such as laptop and phones. Data were collected using tabs provided from ARDC. There were two sets of questions. First set of questionnaires were for the lead farmers and another for extended farmers. Semi-structured questionnaires were used to interview the farmers. Data were collected on topics such as demographic information of lead and extended farmers. Challenges, opportunities and benefits of the lead farmers were also identified. Information on competency level and impacts of training on income and production were also collected. Data were collected from 10th January till 10th February, 2019. Three enumerators were involved in the data collection and it was done through our national language (Dzongkha) and local languages.

3.3.2 Ethical clearance

Prior to carrying out the study, letter of request for survey was sent to the four Dzongkhag heads. After that gups and agriculture extension officers were informed to get approval for the study. Consent for the survey was also asked from the respondents.

3.4 Data analysis

Data were analyzed using Statistical Package for Social Science (SPSS version 23) for multiple response analysis. Paired *t* test was conducted for difference in production of vegetables and income of lead and extended farmers. Thematic analysis was conducted for motivational factors of lead farmer and knowledge learned by extended farmers from the lead farmers. MS-Excel 2016 and Microsoft Word 2016 were used to create tables and graphs to represent the results and findings. The qualitative data were collected based on the views and opinions shared by the farmers during the interview.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Demographic information of the respondents

4.1.1 Respondent's information on age

Young adult aged 18-35 (51.2%) was found to be more active and interested in agriculture compared to middle aged 36-52 (41.5%) farmers. It was mainly because of their interest in agriculture and to learn new skills and technology. It is the age where people usually have strength to carry out physical activities which is very much required in agriculture. There was only three (7.3%) people in elder category (>53 years) who participated in agriculture related activities and got trained as a lead farmer (Table 4.1).

4.1.2 Respondent's information on gender

In four Dzongkhags of eastern Bhutan, 63% male (26) and 37% female (15) participated in the training of lead farmers. The number of male trainees almost doubled the female trainees. Likewise, according to Food and Agriculture Organization (2006), men are attending more trainings compare to female as they are the one who usually practice large scale production and are supported more by the organizations. Likewise, according to Mwamakimbula (2014) more men attended extension training programs as compared to women.

Table 4.1: Demographic information's of the lead farmers.

Demographic information	Description	Percent
Age (years)	18 to 35	51.2
	36 to 52	41.5
	>53	7.3
Gender	Female	37
	Male	63

In 2015 four people have become lead farmers. Eight of the respondents became lead farmers in 2016 and 10 of them in 2017. Total of 19 farmers were trained as a lead farmer from my respondents in 2018 as shown in Table 4.2.

Table 4.2: Number of lead farmers from 2015-2018.

Year	Number of lead farmers
2015	4
2016	8
2017	10
2018	19

4.2 Educational levels of lead farmers

Basic literacy is often considered necessary by the organizations selecting lead farmers. Lead farmers are required to keep records, which requires basic literacy skills. Majority (n=9) of the male lead farmers have attended high school where as majority (n=6) female farmers have attended non-formal education as shown in Figure 4.4. Some (n=6) male lead farmers also attended monastic school and there were one each male and female lead farmer who had completed their degree (Figure 4.1).

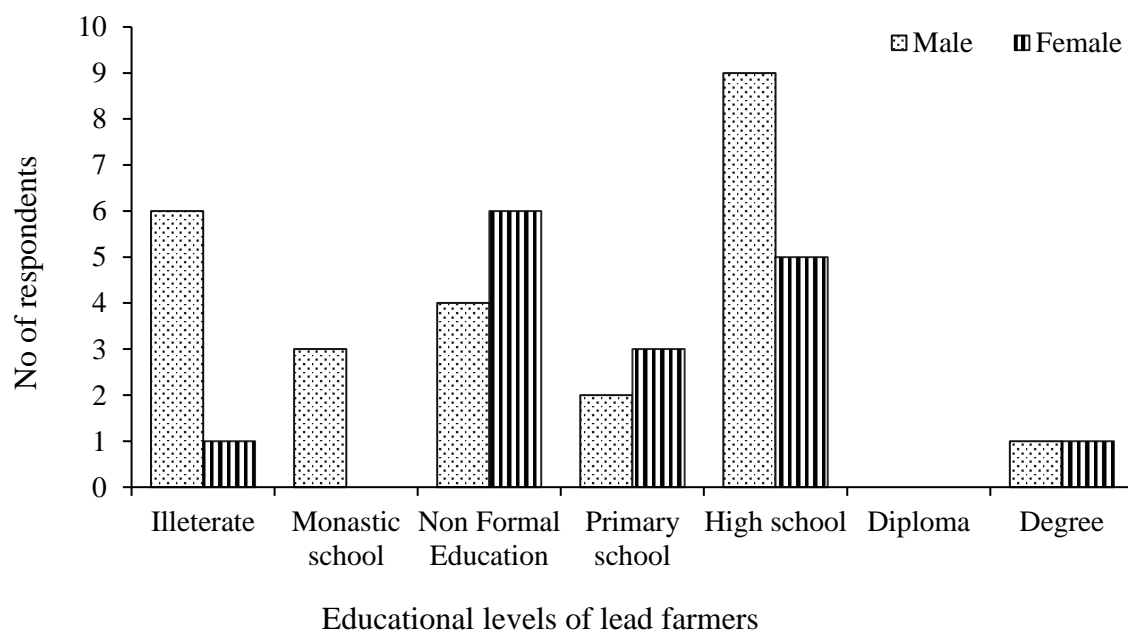


Figure 4.1: Educational levels of lead farmers.

4.3 Competency level based on extended farmers

Majority (59.2%) of the farmers reported that the lead farmers were competent as they were able to teach and explain their learnings. Some farmers (38.8%) reported that they were competent because not only they were able to explain clearly but they were very much available when in need as shown in Figure 4.5. One farmer expressed that the lead farmer was not competent because they were only focusing more on themselves and concerned only about their development. Lead farmers were often provided with some tools and seeds for agriculture but they used all of those things for their production only leaving behind other farmers (Figure 4.2).

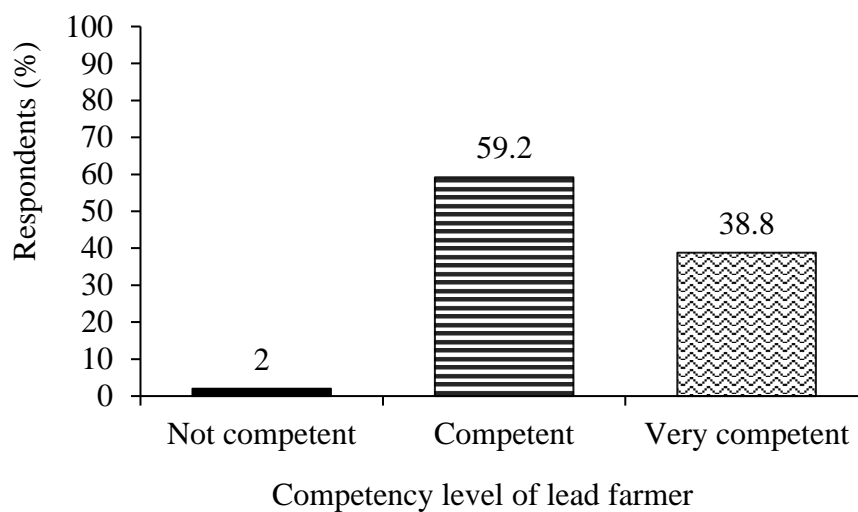


Figure 4.2: Competency levels of lead farmers.

4.4 Training benefits of lead farmer

Mulwafu and Krishnankutty (2012) noted that the lead farmer training had numerous benefits such as networking and linkages in the communities and enhance the exchange of knowledge and sharing of experiences for increasing agricultural production. To note the benefits, multiple response analysis was conducted. The study found that the lead farmers training has benefited mostly to widen their knowledge with majority (46.4%) of responses and then followed by improving their income and production with 23.8% responses. It has also helped them to have lots of practical experiences with 23.8% responses which would not have been possible if they were not invited to the training. Some (4.8%) expressed that they also came to know and meet people during the course of training. It also had other benefits (1.2%) such as boosting their confidence in achieving and knowing something new which they did not know before (Table 4.3).

Table 4.3: Benefits of training on lead farmers.

Training benefits	Responses (%)
Widen knowledge	46.6
Increase in income and production	23.8
Practical experiences	23.8
Increased peers	4.8
Gained confidence	1.2

4.5 Motivating factors to become lead farmer

Majority (40.6%) of the lead farmers motivation to join the training was to gain knowledge on new agriculture techniques so that they can produce more for their living. People wanted to know new technologies which are making agriculture easier and more efficient. Practical experience (32.3%) was the second factor which motivated them to become a lead farmer which give them hand on practice of new technologies followed by wishing to help famers (16.7%) and least (10.4%) to build networks with 10% respectively (Table 4.4). According to Kundhlande et al, (2014), social status was the main motivation for farmers becoming lead farmers, followed by knowledge and early access to technologies. The result of my survey does not agree with his finding because the farmers are not so much interested in social status. All they want is to increase their production and income so that they can make their living easy.

Table 4.4: Motivating factors to become a lead farmer.

Themes	Sub themes	Percent
Practical experience	Sustainable land management	32.3
	Greenhouse usage	
	Grafting and pruning	
Knowledge	Sustainable land management	40.6
	Greenhouse usage	
	Grafting and pruning	
Build networks	Sharing knowledge	10.4
	Meeting new people in training	
	Making public relations	
Help farmers	Motivating other farmers	16.7
	Assist farmers in doing modern agriculture	

4.6 Vegetables production of lead farmers before and after the training

There was a significant difference in production quantity of vegetables before and after the training in Mongar with ($M=442.31$, $SD=234.38$) and ($M=1,284.62$, $SD=836.51$), $t(12) = -3.93$, $p=.002$. Training had significant impact on production in Tashigang ($p=.010$) and Tashiyangtse ($p=.029$) Dzongkhags. However, Lhuentse Dzongkhag showed that there was no significant difference in the quantity of vegetables produced before and after the training. This showed that farmers who went for the training were able to produce more after attending the training in three Dzongkhags. When a farmer goes for training, they get to learn new techniques and ideas which will increase the production in their field. They are also receiving tools for agriculture such as greenhouse plastics and seeds which will enhance their production. In Lhuentse, it might be not significant because the lead farmers were not able to do agriculture activities after the training because of other commitments. While in Mongar it was significant because they were close to ARDC and CARLEP which made them more accessible compared to other Dzongkhags. Nakano et al. (2015) showed that trained farmers improved their rice productivity in Tanzania (Table 4.5).

Table 4.5: Annual vegetable production of lead farmers before and after the training.

	Mean (Kgs)		SD	
	Before training	After training	Before training	After training
Mongar	442.31	234.38	1,284.62	836.51
Tashigang	383.33	1,355.56	271.57	965.80
Lhuentse	333.33	1,616.67	81.65	1,764.56
Tashiyangtse	692.31	1,830.77	1,009.71	2,480.04

4.7 Income of lead farmers before and after the training

There was a significant difference in the income of the lead farmers before ($M=16,923.08$, $SD=22,410.79$) and after the training ($M=45,884.62$, $SD=36,294.03$), $t(40)$, $p=.001$ in Mongar. There was also significant difference ($p=0.012$) for income generation in Tashiyangtse. However, there was no significant difference for income in Lhuentse ($p=.091$) and Tashigang ($p=.128$) (Table 4.6). Farmers reported that the increase in income was mainly due to the knowledge, inputs and support they acquired during the training. In Lhuentse and Tashigang, there was no significant difference in income and it may be due to lack of transport and market place to sell their vegetables.

Table 4.6: Annual income of lead farmers before and after the training.

	Mean (Nu.)		SD	
	Before training	After training	Before training	After training
Mongar	16,923.08	45,884.62	22,410.79	36,294.03
Tashigang	5,444.44	31,500.00	3,468.11	45,374.83
Lhuentse	8,833.33	30,541.67	6,306.08	25,277.66
Tashiyangtse	19,230.77	36,269.23	23,696.53	35,792.58

According to Wardofa & Sassi (2017), during the study of income through farmers training centre found out that there was a positive and statistically significant gain of farm income. The average effect of training on farm income of trained farmers is positive and significant, ranging from 9557 birr/year to 10,388 birr/year on average.

Similarly, the causal effect of training on crop income is positive and significant, ranging from 9901 birr/year to 10,686 birr/year, on average

4.8 Response on knowledge extension to farmers

When asked about their extension of learnings from the training, 30 lead farmers said that they have shared their ideas to other farmers. Eleven of them said that they have not extended their learning's to other people. They were not able to extend their learning's in any form because they were not, they were busy with other things and some reported that they finished the training quite recently.

4.9 Challenges faced as a lead farmer

As a lead farmer they face lots of challenges to extend their knowledge and make people aware of the things they have learned during the training. According to Akinnagbe and Ajayi (2010), it is not easy to convince people because they believe more in well-educated and intelligent people rather than on poor farmer. According to 61% of lead farmers it is challenging to convince farmers. People were not listening and following what they were being told. They were not ready to adopt new changes and ideas. Some other challenges were shortage of machinery tools with 14.6% and marketing 9.8%. One lead farmer (2.4%) reported that he had difficulty keeping records of her income and production because she was illiterate. Marketing is also one of the challenges as they were having issues to sell their products. Amid all these challenges, some farmers 12.2% (5) were also there who expressed that there are no such challenges as of now. It may be because they have not yet extended their services (Figure 4.3). According to Mkwambisi et al. (2013), limited budget and lack of transport were also some challenges. In my study lead farmers were not bothered much with transport as they had road connections.

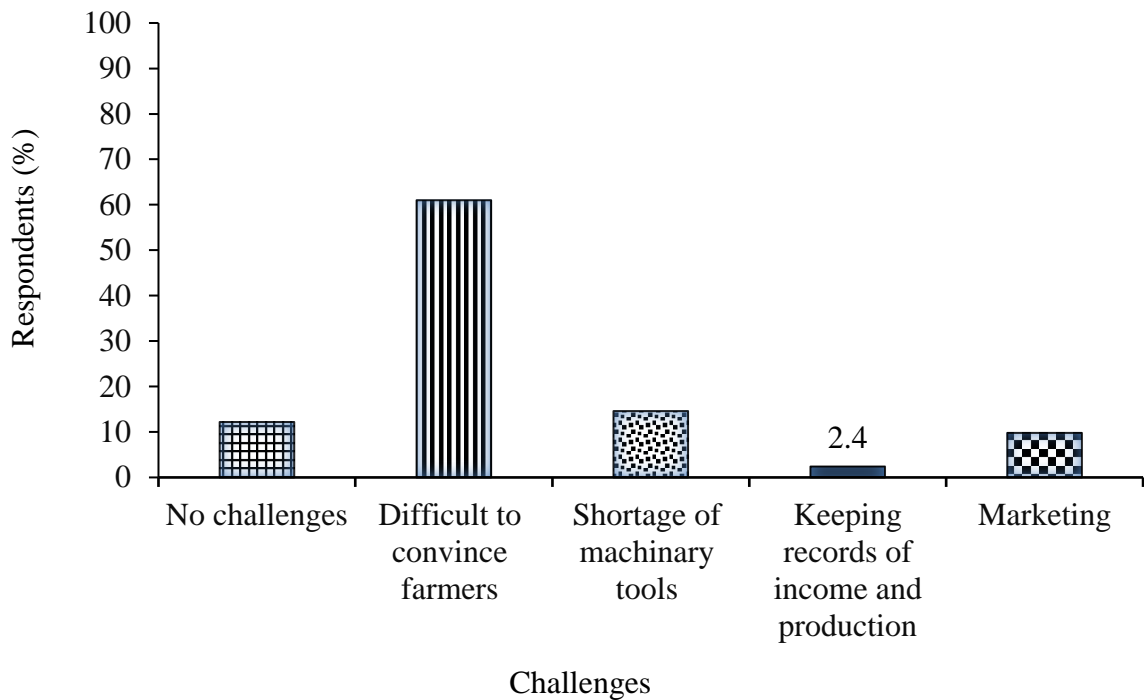


Figure 4.3: Challenges faced by lead farmers during service delivery.

4.10 Opportunities as a lead farmer

Majority of the respondents (44%) reported expansion of knowledge and skill is considered as the number one opportunity they see as a lead farmer. As a lead farmer they are able to teach other farmers and in due course they can also learn from their peers. Twenty nine percent respondents reported, being a lead farmer will help them become independent and sustainable in future as they have more idea on different things. Some (22%) of the respondents see the increase of production and income as a result of participating in the training. 5% of the respondents also reported that in process of teaching and learning they improved public relations (Figure 4.4).

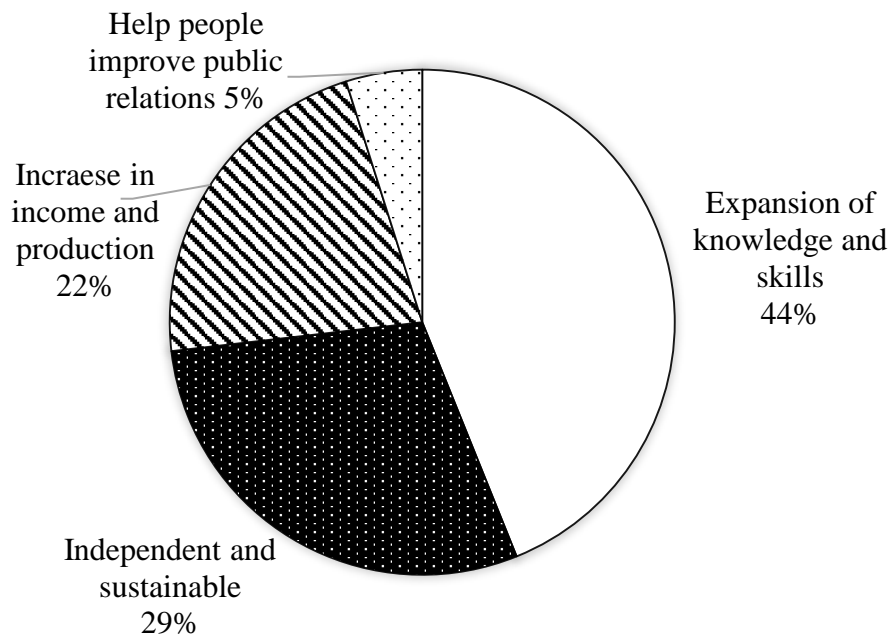


Figure 4.4: Opportunities as a lead farmer

4.11 Support required enhancing extension to the farmers

Giving training and leaving them on their own to extend their learning is very difficult as consideration such as budget, support and so on need to be considered. In terms of the support required in enhancing extension services the main concern was the budget with majority (31.7%) respondents. Lead farmers reported that if there is no budget, they are not able to do any activities. Then 22% of the respondents reported support from village is also required very much because not many fellow farmers are interested in listening to what they have to say or do. Some (19.5%) lead farmers also reported that gewogs should be active and make more use of the lead farmers so that they are more known and able to enhance services. Support in terms of seedlings and other tools are also required so that the farmers are able to do the exact thing lead farmers are doing. Lead farmers also said that there is some support required in marketing their products. Among them some (4.9%) even stated that they don't need any support if the farmers really want to learn they can do on their own by coming and seeking for help they require (Figure 4.5).

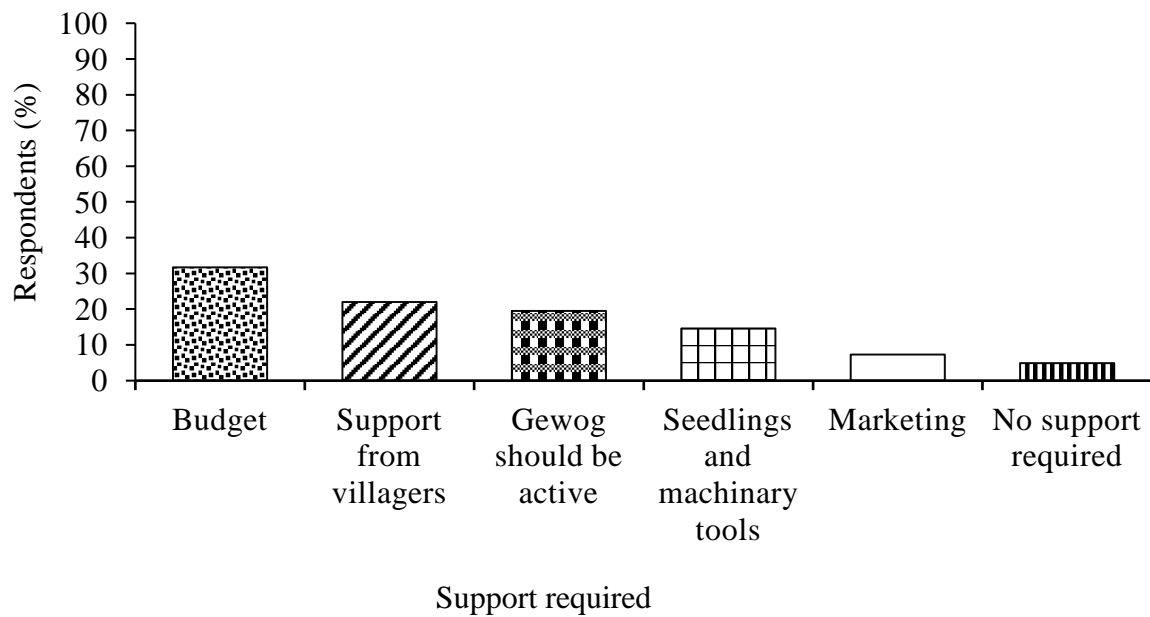


Figure 4.5: Support required by lead farmers while delivering service.

Budget is the main support required by lead farmers in order to enhance their extension. Farmers need more equipment's used in modern agriculture so that can learn better. Due to lack of tools for agriculture people lack interest in attending meetings unless they are made compulsory.

4.12 Gender of extended farmers

There were total of 49 extended farmers who have received some kind of information from the lead farmers. Majority (61%) of the extended farmers was composed of female while 39% was composed of male. Unlike the gender composition of lead farmers, the extended farmers consisted more of female than male participants.

4.13 Awareness of the existence of lead farmer and criteria for their selection

All the 49 extended farmers were aware of the existence of lead farmer in their respective gewogs because they have been interacting with them after their completion of training and even if they did not interact, they knew it from one another. In case of the selection criteria, though there are criteria farmers were not aware of the criteria required to become a lead farmer. They assumed that they got selected because they were educated, active in farming

and so on. As a result of not explaining the criteria properly to the farmers, some lead farmers just attended the training and they are not serving other fellow farmers.

4.14 Impact on income and production of extended farmers due to idea and skills shared by lead farmers

When asked about whether there was impact on production and income from the knowledge and information shared by the lead farmer, thirty of them responded saying that it had impact and nineteen of them said that there was no impact. The people who said there was impact were mostly the members of the group who were led by the lead farmer.

4.15 Impact of extension on production and income of extended farmers

A paired-samples t-test was conducted to compare the production of farmers before and after their extension condition. There was a significant difference in the production before extension ($M=510.00.63$, $SD=240.64$) and after extension ($M=848.57$, $SD=429.34$), $t(34) = -4.78$, $p = 0.000$ in Tashiyangtse. Similarly, there was significant difference in production of vegetables before extension ($M=590.91$, $SD=164.04$) and after extension ($M=727.27$, $SD=173.73$), $t(10) = -2.30$, $p = 0.044$ (Table 4.7).

Table 4.7: Annual vegetable production of extended farmers before and after the extension.

	Mean (Kgs)		SD	
	Before training	After training	Before training	After training
Tashiyangtse	510.00	848.57	240.64	429.34
Lhuentse	590.91	727.27	164.04	173.73

These results suggest that extension really does have an impact on production of the farmers. According to Infantes, Maffioli, and Ubfal, (n.d), the evidences on the impact of extension services on farmers productivity is positive. When farmers learn from their peers and work with them, they are able to increase their productivity.

There was a significant difference in the income of the extended farmers before extension ($M=8,657$, $SD=4,269.88$) and after extension ($M=15,585.71$, $SD=10,767$), $t(34) = -210$, $p=0.000$ in Tashiyangtse Dzongkhag ($<.05$). There was no significant difference in the income of extended farmers before and after the training in Tashigang, Mongar and Lhuentse Dzongkhags ($>.05$).

Table 4.8: Annual income of extended farmers before and after the extension.

	Mean (Kgs)		SD	
	Before training	After training	Before training	After training
Tashiyangtse	510.00	848.57	240.64	429.34

The increase in production led to earning more income. People started to earn more after they were introduced to new techniques and ideas.

4.16 Knowledge learned from lead farmers

Majority of the respondents (31.6%) responded saying they got to learn new farming technologies which were different from the traditional ones. It included grafting, pruning and greenhouse usage. Then followed by it were crop establishment 28.9% of the respondents which included how to manage the soil and grow vegetables. Farmers also stated that they learned about crop management (26.3%) which includes usage of natural herbs to control insects affecting the crops and about integrated pest management. Lastly 13.2% of the respondents responded that they learned about post-harvest activities such as to convert corns into snacks as shown in Table 4.9. Mkwambisi et al. (2013) found that lead farmers are critical in the implementation of various technologies.

Table 4.9: Knowledge learned from lead farmers by extended farmers.

Themes	Sub themes	Percent
Farming technologies	Available farming technologies	31.6
	Climate change adaptation practices	
	Post-harvest technologies	
	Agriculture marketing	
Crop establishment	Hand on practice on crop establishment and management	28.9
	Record keeping	
	Establish farm model	
Crop management practices	Soil fertility	26.3
	Integrated pest management	
	Irrigation management	
Post-harvest technologies	Value addition	13.2
	Seed production technique	
	Farm business and group management	

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Key factor of motivation to become a lead farmer was to gain more knowledge in terms of doing agriculture and then to increase production and income. Other than increasing income and production, there were other benefits such as knowing more people and boosting self-confidence.

The result shows that there is positive impact on production of vegetables and income of lead and extended farmers from the training. Most of the lead farmers belonged to a group of farmers in their villages. They have mostly extended their knowledge in terms of crop management, integrated pest management through verbal conversation and some did it through demonstration. Extension process took place mostly in groups and individual.

Some of the lead farmers were also not able to extend services due to shortage of time after completion of trainings and not being able to convince the farmers. Training showed impact on knowledge where majority of the farmers learned on techniques such as grafting and pruning. They also learned about post-harvest activities such as making snacks from corns. Most of the lead farmers selected were of the right age where they were young and energetic to promote agriculture trainings. Aspiringly more than half (76%) of them were educated.

5.2 Recommendations

Advocacy of lead farmers should be done clearly to the farmers so that they are well aware of the lead farmers. Farmers should be explained detailly about the criteria for selection of lead farmers. Most of the extended farmers reported that, they were not aware of the criteria for selection of lead farmers.

Monitoring of the lead farmers should be done 2-3 times per year by ARDC and CARLEP in order to have productive result. It is very important that majority people of the gewogs are well known about the new agricultural techniques taught to the lead farmers as lead farmers are not selected from each village

Future study can be done on impact of training on production and income generated from livestock as it is not done till date.

References

- Akinnagbe, O. M., & Ajayi, A. R. (2010). Challenges of Farmer-Led Extension Approaches in Nigeria. *World Journal of Agricultural Sciences* , 353-359.
- Amanuel, A. (2007). Farmer Led Innovation: Experiences and Challenges in Ethiopia. *Agriservice Ethiopia*,pp: 1-11.
- Bentley, J., Van Mele, P. and Musimami, G. (2013). The Mud on Their Legs – Farmer to Farmer Videos in Uganda. MEAS Case Study # 3.
- Davis, K., et al., (2010). Impact of Farmers Field School on Agricultural Productivity and Poverty in East Africa. IFRI Discussion Paper 00992.
- Erbaugh, J. M., Donnermeyer, J., Amujal, M., & Kidoido M. (2010). Assessment of Farmers Field School Participation on IPM Adoption in Uganda, *Journal of International Agriculture Education and Extension*, Vol. 17(7).
- Feder, G., & Savastano, S. (2006). The role of opinion leaders in the diffusion of new knowledge: the case of integrated pest management. *World Development* 34(7): 1287–300.
- Food and Agriculture Organization (FAO). (2006). Agriculture, Trade Negotiations, and Gender. Prepared by Zoraid Garcia, with contributions from Jennifer Nyberg and Shayama Owise Saadat. Rome: FAO. Also available at <http://ftp.fao.org/docrep/fao/009/a0493e/a0493e.pdf>.
- Gale, C., Collett, K. & Freccero, P. (2013). Delivering Extension Services through Effective and Inclusive Women's Groups: The Case of SEWA in India. MEAS Case Study #5.
- Hird-Younger, M., and Simpson, B. (2013). Women Extension Volunteers: An Extension Approach for Female Farmers. MEAS Case Study # 2. Available at <https://docs.google.com/viewer?a=v&pid=sites&srcid=bWVhcy1leHRlbnNpb24ub3JnfH B1YmxpY3xneDoxMjZiOGQ4NTliYTQ3MGZl> (accessed August 2014).
- Infantes, P.C., Maffioli, A., & Ubfal, D. (n.d). The Impact of Agricultural Extension Services: The Case of Grape Production in Argentina. Office of evaluation and oversight, Inter-

American Development Bank, StopB-760, 1300 New York Avenue, NW, Washington, D.C. 20577.

Kiptot, E., Franzel, S. & Kirui, J. (2012). Volunteer farmer trainers: Improving smallholder farmers' access to information for a stronger dairy sector. Policy Brief No. 13, 2012, World Agroforestry Centre.

Kiptot, E. & Franzel, S. (2014). Voluntarism as an investment in human, social and financial capital: evidence from a farmer-to-farmer extension program in Kenya. Agriculture and Human Values: Journal of the Agriculture, Food, and Human Values Society. DOI 10.1007/s10460-013-9463-5

Krishnankutty, J., & Mulwafu, A.O. (2012). Prospects of the lead farmer concept for improved livestock development among rural communities in Malawi. Indian Research Journal of Extension Education, Special Issue (Volume I)

Kundhlande, G., Franzel, S., Simpson, B., & Gausi, E. (2014). Farmer-to-farmer extension approach in Malawi: A survey of organizations. ICRAF Working Paper No. 183. Nairobi, World Agroforestry Centre.

<http://www.worldagroforestry.org/downloads/publications/pdfs/WP14391.PDF>

Kundhlande, G., Franzel, S., Simpson, B., & Gausi, E. (2014). Farmer-to-farmer extension approach in Malawi: A survey of organizations. ICRAF Working Paper No. 183. Nairobi, World

Lukuyu, B., Place, F., Franzel, S. & Kiptot, E. (2012). Disseminating Improved Practices: Are Volunteer Farmer Trainers Effective? The Journal of Agricultural Education and Extension, 18:5, 525-540. Available at

<http://dx.doi.org/10.1080/1389224X.2012.707066>.

Mulwafu, A.O., & Krishnankutty, J. (2012). Prospects of the lead farmer concept for improved livestock development among rural communities in Malawi. Indian Research Journal of Extension Education, Special Issue (Volume I), January 2012.

Mkwambisi, D., Khaila, S., Mthinda, C., Mulwafu, A., & Chikowi, M. (2013). Baseline Draft Report for the Agriculture Technology Transfer of the Malawi Agricultural Sector

Wide Approach Support Project (ASWAp-SP). The Millennium Centre for Research and Development, Malawi.

Mwamakimbula, A.M. (2014). Assessment of the factors impacting agricultural extension training programs in Tanzania: a descriptive study. Iowa State University

Nakano, Y., Aida, T., Tsusaka, T.W., & Pedde, O.V. (2015). Is farmer to farmer extension effective? Derived from 10.1016/worlddev.2017.12.13

Pandey, S. N., Maheswari, S., & Mishra, U. (1993). Human Resource Development in Agriculture Sector. Fertilizer Marketing News. 24(7):27

Prasad, S. (1994). Training of Agricultural development: a basic functional area. J. Rural Reconstruction. 27(1): 25-37.

Rivera, W. M. & Amanor, D. (1991). World-wide Institutional Evolution and Forces of Change: New York:ELSEVIER,pp 89-100

Scarborough, V., S. Killough, D.A. Johnson and J. Farrington (eds.). (1997). Farmer-led Extension: Concepts and Practices. London: Intermediate Technology Publications.

Selener, D. J. Chenier and R. Zelaya. (1997). Farmer to Farmer Extension: Lessons from the Field. New York: International Institute for Rural Reconstruction.

Wordofa, M.G., & Sassi, M. (2014). Improving Smallholder Farmers Income through Farmer Training Centers: an Impact Evaluation in Haramaya District, Ethiopia. University of Toronto, School of Social Sciences, Local Development and Global Dynamics, Italy.

Annexure



Figure: Data collection in Toedtsho gewog



Figure: Data collection in Bumdelling gewog



Figure: Data collection in Yangtse gewog



Figure: Bed preparation in Minjay gewog



Figure: Green house in Udzorong gewog



Figure: Tree sapling provided to Lead farmer by ARDC