LOCAL LEVEL INSTITUTIONAL ANALYSIS ON DEPARTMENT OF AGRICULTURE, CHAUNG OO TOWNSHIP

HONEY LYNN LYNN

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The thesis attached here to, entitled **"Local Level Institutional Analysis on Department of Agriculture, Chaung Oo Township"** was prepared and submitted by Honey Lynn Lynn under the direction of the chairperson of the candidate supervisory committee and has been approved by all members of that committee and board of examiners as a partial fulfillment of requirements for the degree of **Master of Agricultural Science (Agricultural Economics).**

Dr. Theingi Myint
Chairperson
Supervisory Committee
Associate Professor
Department of Agricultural Economics
Yezin Agricultural University
Yezin, Nay Pyi Taw

Dr. Khin Oo
External Examiner
Supervisory Committee
Professor and Principal (Retd.)
Rice Crop Specialization (Hmawbi)
Yezin Agricultural University
Yezin, Nay Pyi Taw

Daw Thida Than
Member
Supervisory Committee
Lecturer
Department of Agricultural Economics
Yezin Agricultural University
Yezin, Nay Pyi Taw

Dr. Kyaw Kyaw Win
Member
Supervisory Committee
Professor and Head
Department of Agronomy
Yezin Agricultural University
Yezin, Nay Pyi Taw

Dr. Cho Cho San
Professor and Head
Department of Agricultural Economics
Yezin Agricultural University
Yezin, Nay Pyi Taw

Date----------

This thesis was submitted to the Rector of the Yezin Agricultural University and was accepted as a partial fulfillment of the requirements for the degree of **Master of Agricultural Science (Agricultural Economics).**

Dr. Myo Kywe
Rector
Yezin Agricultural University
Yezin, Nay Pyi Taw

Date----------

DECLARATION OF ORIGINALITY

This thesis represents the original work of the author, except where otherwise stated; it has not been submitted previously for a degree or any other University.

Honey Lynn Lynn

Date----------

DEDICATED TO MY BELOVED PARENTS,

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ABSTRACT

The study assessed the institutional management and system of Department of Agriculture (DOA), Chaung Oo Township comprising current working conditions, linkage with partner institutions (Department of Agricultural Research, private sector and NGO/INGO), perceptions of respondents from DOA itself and partner institutions and sample farmers. It was conducted during September 2015 by collecting primary data from Township Staff Officer from DOA, Research Officer from DAR and respondents from NGO (Pact Myanmar Microfinance) and private sector with key informant interview and all extension staff (28) from DOA and a total of 77 sample farmers with semi structured questionnaire. Focus group discussions with farmers were also done in seven sample villages.

Main findings were all extension staff had a few training experiences especially on plant protection, seed and in service trainings. In working conditions, individual staff had too many farmers to contact and about half of them had normal visit to assigned area with main objectives such as to conduct, observe demonstration farms, to record and collect data and to provide seed. Among extension methods, group meeting, farm and home visit and demonstration were common. Most staff thought that they commonly held group work discussion and assigned duties were equally distributed among them. However, most staff perceived that staff's promotion system was not systematic and received unfair opportunities. Current linkage between DOA and DAR, NGO/INGO, private sector was weak. Perceptions of respondents for DOA improvement were sufficient number of qualified staff, adequate provision of trainings and budget to staff, more coordination with private sector and NGO/INGO, more conducting extension activities with farmers, and disseminating local specific technologies to farmers and accessible market and price were required. Main reasons expressed by non-contact farmers were time constraints, non interest, and lack of money for coordination with DOA. About half of sample farmers perceived that extension services were partial fulfilled by their technological requirement, but they were fair qualified and relevant in local condition. The extension contact frequency of farmers with DOA extension staff was positively and significantly affected by number of family labor, participation in various organizations and coordination activities of DOA. Ageing farmers and shorter distance between villages and town were negatively related to contact frequency.

According to the study, institutional strengthening and capacity building at township level DOA are required. Adequate training opportunities for all level of

extension staff should be provided. Systematic and transparent promotion system should be developed for all levels of staff. Travelling allowance, mobile facilities, vehicles and residential supports would be essential for create motivation of DOA staff. Extension methods such as FFS and field day, mass media that all level of farmers can participate and improve their knowledge should be used increasingly. Effective collaboration and contact between extension and research institution, and improvement of public-private extension are necessary to increase the efficiency of agricultural extension. Technologies diffusion and extension activities should be carried out with consideration on all marketable crops. Extension programs should be planned and implemented with proper consideration of farmers' socio economic conditions, knowledge and technological-needs.

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LIST OF ABBREVIATIONS

ACIAR	Australia Centre for International Agricultural Research
AFC	Agriculture and Finance Consultants
AS	Apprentice Staff
ASO	Assistant Staff Officer
AED	Agricultural Extension Division
CPA	Certificate for Pesticide Application
DASO	Deputy Assistant Staff Officer
DAR	Department of Agricultural Research
DOA	Department of Agriculture
DSO	Deputy Staff Officer
FAO	Food and Agriculture Organization
FFS	Farmer Field School
FGD	Focus Group Discussion
GAD	General Administrative Department
GAP	Good Agricultural Practices
INGO	International Non-Government Organization
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
KII	Key Informant Interview
LIFT	Livelihoods and Food Security Trust Fund
MAS	Myanmar Agriculture Service
MOAI	Ministry of Agriculture and Irrigation
NGO	Non-Government Organization
PACT	Private Agency Collaborating Together
PEA	Participatory Extension Approach
PP	Plant Protection
RELCs	Research-Extension-Farmers Linkage Committees
R&E	Research and Extension
SCS	Selected Concentrative Strategy
SHY	Special High Yielding Program

SMS	Subject Matter Specialist
SPSS	Statistical Package for Social Sciences
SSI	Semi Structured Interview
T&V	Training and Visit System
TSO	Township Staff Officer
UNDP	United Nations Development Program
YAU	Yezin Agricultural University

CHAPTER I
INTRODUCTION

1.1 Background Information of the Study

In Myanmar, about 65% of total population live in rural areas and are employed in the agriculture, livestock and fishery sectors for their livelihood. Agriculture sector plays an essential role for more food production with the growing population as well as for the country to occupy a large part of the export earnings. Development in agricultural sector will be significantly influenced by enhancement in production efficiency, which in turn depends on the development of and use of appropriate technologies and effective and efficient application of agricultural inputs. To raise agricultural production in the country, support of extension with better and improved farming practices, research and transfer of technology and adequate supply of agricultural inputs with reasonable price play a vital role.

Among the institutions under Ministry of Agriculture, Livestock and Irrigation, Department of Agriculture (DOA) is the sole government institution responsible for providing public extension services to the farmers. The functions of the DOA are carried out by the Director General, with fifteen divisions namely, Sugar Crops Division, Cotton and Allied Fiber Crops Division, Perennial Crops Division, Coffee and Seasonal Crops Division, Policy and Administration Division, Supply and Logistics Division, Finance Division, Project Planning and Management Evaluation Division, Seed Division, Land Use Division, Plant Protection Division, Horticulture and Plant Biotechnology Division, Rice Division, In Service Training Center and State Agriculture Institute Division, Agricultural Extension Division (DOA 2017). Among the divisions of DOA, the Agricultural Extension Division (AED) plays an important role in modernizing the agricultural extension sector to promote and support technological innovation and behavioral change to meet farmers' needs.

1.2 Agricultural Extension Division

The AED is headed by a Director General at headquarter and is organized on a region or state basis, with offices at the district and township levels. The staff hierarchy of the AED is multi-layered including Director General of DOA, Deputy Director General, Director Deputy Director, Assistant Director, Regional/State Staff Officer, District Staff Officer, Township Staff Officer, Deputy Staff Officer, Assistant Staff Officer and Deputy Assistant Staff Officer. National, State and regional levels have main responsibilities on formulation of extension planning, training, monitoring and evaluation and district,

township levels engaged with more on implementation of extension programs and projects.

The AED has been undertaking the following extension activities:

- Training and capacity building of extension agents;
- Training of farmers in transfer of technology through Farmers Field Schools (FFS);
- Farmers to farmers discussion, training and education;
- Farmer-based participatory demonstration trials and field visits by local authorities and extension agents;
- Delivery of educational materials, pamphlets, newsletters and books on new crops;
- Education of farmers on the utilization of quality seed, drum seeder, combine harvester, dryers, etc.
- Explanation of post-production losses in rice production to the farmers; cooperation among government, non-government and other relevant institutions for the dissemination of advanced technology at village level (DOA 2013).

In terms of staff' strength, total numbers of staff in DOA are 14,774 staff. Among them, AED, one division of DOA, comprised with largest number of staff (9,414) in which 7,516 are agricultural technicians (extension staff). There are about 4.4 million farm households in Myanmar and so the ratio of extension staff and farm family is about 1 to 585. In terms of sown acres, there were 15,456,060 hectares for major crops growing area in Myanmar. Therefore, one of extension staffs take responsibility for 2,056 hectares for major crops growing area in average. Education level of extension staff AED composed 5 staff among 53 Ph.D holders of DOA staff, 41staff among 188 master degree of DOA staff, 1,576 staff among 2,653 DOA staff in B.Agr.Sc and 4,059 extension staff were diploma degree among 4,164 staff of DOA and the left,1835 staff, were other degree holders and matriculated (DOA 2017).

1.3 Agricultural Extension Services and Extension Programs in Myanmar

In history of Myanmar extension system and services, Myanmar Conventional Agricultural Extension System has been used since 1927. In this system, extension staff met with their clienteles individually or in groups and conducted extension activities such as discussions about technical problems, field visits and demonstrations. In this approach, agricultural research priorities were determined by scientists and by funding agencies. Scientists experiment in laboratory and on-station to generate new technology, which was then handed over to the extension department for transfer to the farmers.

In 1976, Training and Visit (T&V) approach was introduced in major rice growing area by the aid of World Bank project. In this approach, there were four components, farmer-groups, contact farmers, coverage of extension worker and organizational structure and mainly emphasized on contact farmers. It is a strategy that ensures the systematic transfer of technical know-how from the Research Agency to the Subject Matter Specialist (SMS) of the Projects Extension Services and again to the different level of extension agents during the training, workshops, discussion, etc. This approach was not continued due to inadequate number of subject matter specialists and motilities after the completion of the World Bank project.

Selected Concentrative Strategy (SCS) was laid down in a special high yielding production program (SHY) in 1978. Selectivity in the program was in terms of locality, rice variety, extension personnel and management. The whole township high yielding varieties programs under the SCS approach produced significant increases in yields– two to three times than that of the national average yields in maize, groundnut, sunflower, cotton, wheat, sorghum, jute, potato and pulses (MAS 1999).

More participatory extension approaches have been attempted by AED. These are based on the selection of pilot areas and farmers' groups, where extension agents and farmers design crop development plans based on perceived constraints. Crop plans are packages of technologies demonstrated to farmers in study plots. Meetings, training and field days are conducted in the demonstration sites. The Farmer Field School is another recent participatory extension approach introduced by the Plant Protection Division. It is based on non-formal adult education methods that focus more on discussion and experimentation rather than traditional training.

Components of extension system in Myanmar were expressed as follows:

(a) Special crop production zone

Special crop production zone for other crops were practiced for crops like groundnut, sesame, sunflower, black gram, green gram, pigeon pea and other crops.

(b) Block-wise crop production program

It is practiced at both entrances of each town for monsoon rice, summer rice and other crops according to the localities. In this system, usages of foundation seeds, certified seeds and appropriate agro-techniques were applied.

(c) Participatory technology development approach

It is to select the pilot project area with 20-30 contact farmers at every village tract level in the township. The extension agents and participating farmers formulate the designs.

(d) Farmer's Field School Model

Extension methods in practice are: (a) launching special programs in selected areas for selected crops (b) establishing efficient contacts between farmers and extension agents through agricultural education camps and seasonal demonstrations (c) training and visit systems on farmers' fields (d) conducting demonstration of technology packages in large blocks on farmers' fields (c) launching regional development programs in border areas and (f) conducting integrated rural development programs, in addition to traditional extension methods (UNDP 2007).

1.4 Myanmar Agricultural Extension, Research and Private Sector

1.4.1 Agricultural extension and research

In Myanmar, agricultural research and extension organizations both at the national and regional levels were established as instruments for promoting agricultural development and improving the quality of life of farmers. AED plays a key role in disseminating research findings and proper message to the farmers, and feedback to researchers on farmers' reactions to improved technology. On the other hand, Department of Agriculture (DAR) has seven crop research centers and 17 satellite farms. The mission of the DAR is "to systematically conduct research activities that would suit to the needs of all stakeholders which include producers, distributors and consumers in developing and dissemination of regionally adapted crop varieties and crop production technologies".

In terms of seed for farmers to use high quality, breeder seed is produced by DAR and foundation seed is produced with the coordination of DAR and DOA (seed division). Then DOA produces registered seed and distribution of certified seed was with extension division and contact farmers. Therefore, research, technology, and the extension of appropriate research and technologies are very important for advancement of an efficient agricultural system and enhancing sustainability for economic development.

Current linkage activities between research and extension institutions are the followings:

- ✓ National level annual review meeting of DAR for the purpose of drawing up research programs based on feedback of the farmers,

- ✓ Joint meeting on quality seed production and distribution with a purpose to increase production and provision of good quality seeds and certified seed multiplication program,
- ✓ Joint field survey, field trip and field days especially at the experiment stations in cooperation with ACIAR, JICA and IRRI,
- ✓ Consultation meetings, to identify and/or to solve the problems faced in the implementation of various crop production programs.

Even though the preliminary and advanced trials are conducted as on-station trials, followed by on-farm trials, implementation of on-farm trials is still a weak chain and technology diffusion covers limited scope. There is moderately strong linkage between research and extension, most of extension personnel at township level do not have a close working relationship with research personnel and there is no research and extension coordination body at state/regional levels (DOA 2017).

Linkages between extension professionals and researchers are generally very weak and extension agents rarely come to the research stations and researchers do not routinely visit extension offices or demonstration sites (Khin Mar Cho 2013). Although research institutions can offer technical information, the extension agents have inadequate contact with resource institution for their technical knowledge and information. The institution also requires some information and problems experienced by farmers from extension service to do researches and give valuable information which are very useful for farmers. However, there is poorly linked research and extension (R&E) system in Myanmar (Khin Oo 2007). Myanmar research and extension system is severely underfunded and needs to do a better job of connecting research to meet the needs of all farmers. Extension provision remains top-down rather than tailored to farmers' realities while research is concentrated in certain agro-ecological zones and is heavily rice focused. To resolve these shortcomings, major investments and a realignment of priorities are needed across the research and extension system (Than Tun et al. 2015).

1.4.2 Role of private sector in Myanmar agricultural extension

Agricultural extension is very important to improve farmers' decision making and help them take advantage of more efficient technologies and farming practices. In Myanmar, extension services are typically delivered through a government entity, but increasingly more extension services are offered by agro-dealers or companies and engaging in contract farming. Government and NGOs offer extension services in order to

increase yield and reduce poverty and increase food security. Contract farming schemes offer extension services to improve yield and quality while agro-dealers offer them to make sure their products are used effectively and to build a relationship with farmers. The government should more emphasize in creating an enabling environment for private sector involvement for rural development and give more mutual understanding the potential role of the private sector in extension service provision (Than Tun et al. 2015).

In terms of private sector spending on agriculture research and development, Myanmar also lags behind (Raitzer et al. 2008). People-centered approach, community participation and public-private partnership are important strategic steps for sustainable development of the agricultural sector in the Dry Zone. In terms of gaps at the level of institutions and processes, provision of funds for extension services and research are inadequate which negatively impacts private sector engagement in agricultural development. Collaboration between government agencies and private sector is also weak in monitoring and evaluation of projects and plans particularly in the areas of technology transfer for crop production and quality improvement (Tin Maung Shwe 2016). In the private sector mainly the suppliers of fertilizer and agro-chemicals became important providers of information and advice at various levels. There is wide range of input-supply shops at township level and this network is fast expanding. Additionally the main fertilizer and agro-chemical companies became very active in the countryside and their agronomists tour the villages and arrange farmers meetings and field-days. Some commercial companies have strong informal linkages with the public institutions and their personals as business partners (AFC Consultants 2015).

1.5 Rationale of the Study

Among the institutions under Ministry of Agriculture, Livestock and Irrigation, Department of Agriculture (DOA) is the sole government institution responsible for providing public extension services to the farmers (MOAI 2015). The Agricultural Extension Division (AED), the biggest division among the divisions of DOA, plays an important role in modernizing the agricultural extension sector to promote and support technological innovation and behavioral change to meet farmers' needs. A number of structural changes and reforms are required to improve the linkages between the agricultural education, research and extension institutions on the one hand, but on the other hand also adjusting the orientation of agricultural policy in general towards the problems and the needs of the farming community. An improved agricultural extension system will be primary mechanism for achieving new policy objectives such as income

generation, improved quality of agricultural products. Policy changes, institutional reorganization, and the strengthening of organizations are required to enhance extension especially in developing countries. Moreover, agricultural extension services in Myanmar were centrally controlled, bureaucratically oriented and directed by professional staff. The organizational framework did not provide for decision-making from below and there is no room for participation of all members of the extension system (Khin Mar Cho et.al 2003). Poorly motivated staff and management, inappropriate in-service training and insufficient linkage with research and non-government organizations were also found in Myanmar extension services. Moreover, consideration of farm constraints, requirement of farmers, local extension opinions were no found in extension programs planning. Very few researches and investigations have been conducted on Myanmar agricultural extension services in the past and understanding of the extension services and measuring of extension's impact should be conducted at the grass root and advanced level (Khin Oo 2007).

1.6 Objectives of the Study

The general objective was to study institutional management systems of the Department of Agriculture, Chaung Oo Township. The main specific objectives of the study were as follows:

(1) To observe the current working conditions of DOA and linkage between DOA and DAR, private sector and NGO/INGO,

(2) To find out the institutional management and system of township level DOA according to the perceptions of respondents from DOA, DAR, private sector and NGO/INGO,

(3) To examine the characteristics of sample farmers and their perceptions on extension services provided by DOA and,

(4) To analyze the influencing factors on contact frequency of sample farmers with DOA extension staff in Chaung Oo Township.

CHAPTER II

LITERATURE REVIEW

2.1 Concept of Agricultural Extension

According to Rivera et al. (2003), extension is a non-formal educational function that applies to any institution that disseminates information and advice with the intention of promoting knowledge, attitudes, skills and aspirations, although the term "extension" tends to be associated with agriculture and rural development. Extension combines educational methodologies, communication and group techniques in promoting agricultural and rural development. It includes technology transfer, facilitation, and advisory services as well as information services and adult education.

Extensions work as a bridge between research and farmers and serve as a one-way procession of newly developed agricultural technologies and policy directives on their way to be utilized by farmers. The duty of extension workers is to translate these technologies and directives into terms farmers could understand then to persuade as many farmers as possible to employ them (Swanson et al. 1998). The role of public sector extension in most countries largely contributes to the national agricultural development goals. So, national food security could be achieved, rural livelihoods would be improved and farmers would be empowered by building social capital, and natural resource management would also be improved (Swanson and Rajalahti 2010).

Extension activities and services are carried out by a wide range of organizations in the private business and non-profit sectors. The traditional concept of public agricultural extension involves a professional body of agricultural experts (generally government employees) who teach improved methods of farming, demonstrate innovations, and organize farmer meetings and field days on a wide range of topics. Private firms provide services to farmers especially with their specific gifts and incentives and farmers perceived that private firms were most beneficial for them (Schwartz 1994).

2.2 Importance of Agriculture Extension Programs

Improving rural livelihoods is a stated goal among many developing countries and to achieve this goal, most agricultural extension systems will have to change their strategy, approach, and management structure, as well as upgrade the skills and competencies of their extension staff. In most cases, this will require transforming the traditional top down, technology-driven extension model to a more decentralized, farmer led, and market-driven extension system (Swanson 1990).

Priority setting at program level would be inter-institutional and multidisciplinary with participation of all stakeholders, including research, extension and farmers' representatives. It should contribute to avoid overlaps and duplications, and should increase the level of institutional coordination in research, extension and training within each national program (FAO 2004).

Generally, different agricultural institutions plan extension programs with no consideration of different agro-ecological or socio-economic conditions and extension programs and services give much attention on the use of high levels of agricultural inputs and irrigation access but not on most of small resource limited farmers. As a consequence of weak agro-ecologically driven research activities and inadequate mechanisms of extension institutions to assess to basic farmers' needs, environmental limitations and socio-economic conditions in the extension programs planning, there is a low rate of adoption of improved technologies, which results in low yields, insufficient farmers' income, and limited production of the main commodities. Considerable investments in both financial and institutional terms with an improvement in the capacity of research and extension personnel are required to plan effective extension programs (FAO 2004).

The problems of developing or keeping an effective agricultural extension service can be mark out to the lack of a representative policy or an unsteady policy framework for drawing up and formulation of the extension system. Some of problems that highpoint the issue of extension policy are unclear information on extension' functions, the clients to be served, how budget was allocated efficiently, how often changes in organizational structure and redrawing program priorities, rapid turnover of the extension staff, and lack of coordination between different organizations that undertake extension work are some of the common problems that highpoint the issue of extension policy. The extension system must decentralize its planning approach in order to give local managers (state/division, district, township, and village tract) responsibilities and resources to plan and implement extension program relevant to their specific agro-ecological and socio-economic conditions (Haque 2000).

Most of the extension messages are centrally designed by managers and implemented by field staff over a wide range of agro-ecological and socio-economic conditions, without proper consideration of farmers' needs and limitations, and available markets. The consequence of this approach is the low adoption rate of most technical recommendations. Due to the top-down nature of the extension messages and non-

participatory approach of technology generation, the interactions and linkages between institutions and farmers have become weak and nonfunctional (FAO 2013).

2.3 Linkage between Research and Extension

In developing countries, many of the problems arise from lack of organizational and operational cooperation and linkage between research, extension, and educational institutions. Moreover, poor program design and implementation especially in developing countries have led to poor performance and poor links with client farmers and the research sector and researchers and extension workers are ignorant of each other's activities and research stops too early and extension starts too late in what should be a continuous process. Farming systems research and extension and on-farm trials are considered the important techniques to link research and extension in these institutions. Partnerships, built on mutual trust and respect, are a key component in the development and delivery of successful research, education and extension programs (Sadighi 2005).

Farmers rely on research and extension to help improve their know-how, efficiency, productivity, profitability, and contribution to the benefit of their livelihoods. In turn, the research and extension organizations came to appreciate the important role of farmers and farmer organizations play both in disseminating technology and through effective feedback mechanisms. However, the lack of a close working relationship between national agricultural research and extension organizations and farmers is one of the most challenging institutional problems that the ministries of agriculture are facing in many developing nations. When a strong connection is built and maintained between all three key partners (researcher-extension officer-farmer), their coordination activities can lead to increase productivity sustainably, income and welfare of farm people, and to the promotion of national food security and economic growth (Odame 2015).

Ewell (1989) expressed that research organizations need to start with the world stock of knowledge and go on until the technology is fully integrated within a social system. Extension on the other hand, should start from the stage of technology testing and continue until the innovation has been adopted by the farmers. Technology testing, adaptation, and incorporation which make up the interface between the two systems were common elements between research and extension organization. However, major problems in the developing world are those where researchers and technology transfer workers are unconscious of each other's activities. Also, in practice, research stops too early and extension starts too late in what should be a continuous process.

Swanson and Peterson (1989) also recognized weak linkage between research and extension as the most serious institutional problem that constrained the flow of technology to farmers in many developing countries. Several factors such as separate institutional housing, separate budgets and work plans, attitudinal problems, and social, economic and educational gaps between research and extension personnel contribute to this weak linkage.

Schwartz (1991) developed the model to identify and explain the factors involved in institutional research and extension activities, and to demonstrate the relationships between these factors. In the following model shown in Figure 2.1, two major categories of linkage factors: the external linkage factors represent forces outside of the institutional environment which include policy environment, technical assistance, public organizations, and the private sector/farmers. The internal linkage factors explain conditions such as institutional factors and operational linkage strategies that can be manipulated by the institutions. Most of the factors are linked among each other for the national technology generation and transfer programs.

2.4 Private Sector Involvement in Agricultural Extension

There is growing involvement of the private sector, both nonprofit and commercial organizations, in agricultural extension and these organizations are partners in technology generation and transfer. Private corporations such as seed and agrochemical companies play a significant role in developing some types of technology, providing inputs, and advising farmers on their use. Private companies and non-profit organizations also provide advice to farmers on agrochemical and other input use. Extension organizations need to develop communication and coordination linkages with these actors to achieve national' goals (FAO 2013).

In most countries, public agricultural extension institutions have duties and functions for providing a two-way communication of improved technology and information between research and farmers. They operate in an institutional environment that includes public and private organizations that involve in agriculture. Especially, those other actors involved in generating and transferring agricultural technology must be observed and understood to improve extension's effectiveness and efficiency (Swanson 1998).

Schwartz (1994) said that success in disseminating improved technologies by extension organizations require functional linkages with stakeholders including farmers, research institutions, training centers, and the private sector. Decentralization of extension

planning and upgrade of skills of extension staff would facilitate the establishment of effective linkage mechanisms. Agricultural extension in many countries has come to encompass a wide range of activities in both the public and private sectors, yet the exchange of information continues to be the primary focus of all extension activities. As each type of extension (public and private) has limitations, the objective for farmers and agricultural development organizations of all types (local and international) is to attain the best mixture of public, private and NGO services.

To increase agricultural productivity and farm household income, while maintaining the resource base and addressing equity concerns, requires an interactive technology system whereby farmers and farm organization, research, extension, input suppliers, Non-Government Organization (NGO) and other agencies work together in a coordinated manner (Swanson 1990).

2.5 Challenges Faced by Myanmar Agricultural Extension

Regarding extension services in Myanmar, agricultural extension division have a very large number of staff assigned to all hierarchical levels and stationed in all geographical units throughout the country. But, technical skills and academic qualification of this large work force are limited and extension staff had limited mobility, poor motivation as a result of low salaries and benefits, and competing demands to undertake unrelated tasks (FAO 2004).

Challenges in technology transfer and extension services of the AED are weakness in the delivery of appropriate technologies adaptable to the ecological conditions, limited technical skills and knowledge of extension staff, limited budget and weak logistic support, confusion of extension and delivery platform to provide the necessary information and technologies to the farmers, weakness of two way flow of information between research and extension, consequently, weakness of appropriate technology to extend to the farmers, limited investment in capacity building, research, development and extension to equip the extension staff with technical skill, human relation skill and conceptual skills, weakness in proactive and strategic research and extension plans to meet the needs of farmers and weak in coordination and cooperation among the rural development implementing agencies (DOA 2017).

Accordingly, operational linkages between research institutions and among research, extension, and training organizations within MOAI are very weak. There are many institutions that conduct research in a variety of crops, and topics, without any systematic mechanism of coordination, exposing the process of technology generation to

duplications and overlaps with consequent low. Success in disseminating improved technologies by extension organizations requires functional linkages with stakeholders including farmers, research institutions, training centers and the private sector (FAO 2013).

Most of research programs are commodity based and production oriented. Research and extension programs centrally planned at headquarters and normally do not take into account farmers' needs and constraints, and similar activities are repeated year after year without a clear objective (FAO 2013).

2.6 Reviews on Related Studies

Rathore, S et al. (2008) carried out analysis of research-extension-farmer linkage in the Arid Zone of India with the interviewing of fourteen agriculture scientists concerned with the generation of the technologies related to crop production and protection and 27 extension personnel who were dealing with transfer of technology work in the region for the purpose. It was found that the field level extension personnel were having more contact with the farmers but they were able to provide knowledge up to the limited extents and higher level extension specialists did not have direct and regular contact with the farmers.

Domekpor (2003) made an assessment of the research-extension linkages in Ghana. Findings indicated that attendance at farmers' day celebrations, mini demonstrations are among the highly ranked activities by researchers and extension agents as closely bringing farmers, extension agents and researchers together. On the other hand, joint priority setting and planning exercises, an activity which the Extension-Farmers Linkage Committees (RELCs) undertakes were ranked low because prioritization of problems and needs of farmers at the zonal level ignored certain pressing needs of farmers at the district or local level. Problems perceived as hindering the research-extension linkages were differences in policy directives because inadequate or no funds for logistics support to enhance research-extension activities and high costs of agricultural inputs which make it difficult for farmers to use technologies or adopt technology packages.

Dimelu, M.U and A.C. Anyanwu (2008) examined the linkage behavior and practices of agencies in the agricultural innovation transfer sub system in Southeastern Nigeria. The study revealed that there was poor linkage among the agencies and factors that cause constraint linkages among the agencies were policy related, governmental, attitude–related, and motivational. The study concluded that operational and structural

mechanisms should be put in place to facilitate strong and effective linkages for efficiency of resource use and cost effectiveness through synergies and complementarities of efforts. Government should facilitate public-public and public-private linkages in the sub-system. Existing institutional framework for linkages between research and extension system should be re-visited to evolve more dynamic arrangements and to create mechanism for increase participation of private agencies. Also policy makers should invest on orientation and building linkage leadership among administrators and extension practitioners to stimulate innovation culture.

Margono and Sugimo (2011) conducted survey on the government and extension workers that was conducted in Jakarta, Depok, Cibinong, Bogor, and Bandung. The survey was done by questionnaires and in-person interviews and total of 50 respondents were chosen by purposive sampling. The results indicated that a well-coordinated system among government, public and private organizations was required and in-service training programs must be organized on a regular basis to help extension agents develop knowledge, skills and attitudes necessary to meet increasingly diverse demands. If agricultural extension is to contribute significantly to the agricultural development, it must provide timely and competent services and must have strong contact between extension workers and farmers through, among others, hiring professional extension workers who have adequate training in extension methods and communication skills and technical including information and technology, marketing and agricultural management issues.

Khin Oo (2007) studied existing conditions of Myanmar extension services in Mandalay Division which has one of the largest agricultural extension services at the divisional level in Myanmar. The data were collected from the total sample number of 206 with the structured interview schedule in group interview method and analyzed by statistical package for social science (SPSS) program. The major perceived problems in three specific crop-oriented organization were (a) poor transportation, little cooperation of local people in extension program implementation and problems with conservative and poor farmers as complained by Myanmar Agriculture Services; (b) irrelevant extension programs to the needs of community, no suitable markets and prices for farmers, inadequate staff and many farmers to advise and problems with illiterate farmers as indicated by Myanma Cotton and Sericulture Enterprise; and (c) little involvement of local people in extension planning and lack of incentives for staff as perceived by Myanma Sugarcane Enterprise.

Oladosu, I. O. (2006) focused on the attitude of farmers towards extension agents in Ogbomoso Zone of Oyo State. 100 farmers and 30 extension agents were selected as as sample using stratified sampling technique. The results showed that most of sample (farmers) had very favorable attitude towards the extension services. The extension teaching methods commonly adopted by the extension agents were farm and home visit (92%), demonstration (84%), posters (77%) among other. But, differences existed between frequency of contact and attitude of farmers towards the extension agents significantly.

Benjamin (2013) studied farmers' perception of effectiveness of agricultural extension delivery in Cross-River State, Nigeria. In the study, a total number of 180 farmers participating in extension program in Cross River state were randomly selected using the multi-stage random sampling technique. The study found that farmers agreed on the fact that extension delivery process was not very effective. Farmer visits, meetings between farmers and extension personnel, demonstration were the strongest links in the delivery process areas while the weakest links were organization of research-extension-farmer-linkages, farmer training program and distribution of training materials.

Assessment of agricultural extension services in Tanzania: A case study of Kyela, Songea Rural, and Morogoro Rural Districts was conducted by Daniel (2013). Extension workers and farmers were interviewed with semi-structured interviews. Results showed that most of extension officer are generalist. All villages in study area had not access to extension services. Moreover, main challenge concerned inefficient allocation of budget for extension services. Challenges faced by extension officers were poor working environments including a lack of reliable of mobility to reach the farmers, restricted budget support to carrying out demonstrations and field experiments on new technologies, sub-optimal housing, lack of working facilities and low salaries. As a result, extension officers were not motivated to perform their duties well. Although farmers recognized the role and importance of having an extension officer in their areas, many have not yet to adopted new agricultural technologies disseminated. They also had inadequate knowledge on farm management skills like correct land preparation, timely planting, pest and diseases and their control, timely weed control knowledge on nutrient deficiency symptoms and how to correct them and keeping farm records.

Haq (2011) observed examining the factors determining the contacts between extension agents and farmers in some selected sites of Gazipur District. Findings revealed that education of farmers, size of farm families, number of earners of farm families,

irrigation and villages which were nearer to the upazila headquarters are key determinants for a household participation in extension contact. On the other hand, the size of farm, age of the farm household head, chemical fertilizer, distance between farm land to nearest market and upazila dummy variables had no direct relationship with the extension agents.

The agricultural extension contact in Bangladesh was done by Haq (2012). Total numbers of fifty farmers were collected from two sub districts of the Gazipur district in Bangladesh. Results showed that the contact coefficient of three times and above is higher (0.353) compared to the contact coefficient one and two times (0.234). A positive correlation was found with the education level, the share of the agricultural income in the total farmhouse income, and the number of adults in the farm household. On the other hand, the head of the farm household's age was inversely proportional to the frequency of contacts with the extension agents. From these facts, it was clarified that the agricultural extension services do not work well enough for elder farmers, especially those with low education levels.

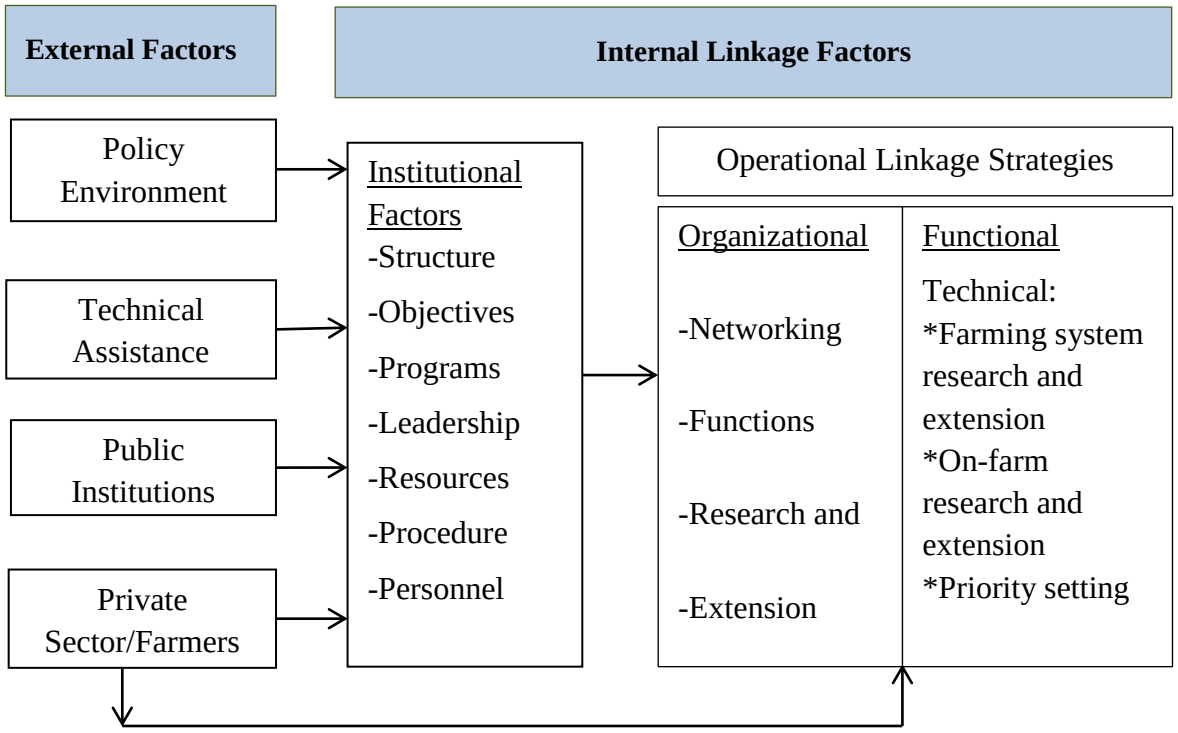

Figure 2.1 Research and extension linkage model for institutions in developing countries

Source: Schwartz (1991)

CHAPTER III
RESEARCH METHODOLOGY

3.1 Conceptual framework of the Study

Main function of Agricultural Extension Division, Department of Agriculture is to transfer appropriate agricultural technologies to farmers in different agro ecological conditions and also organizes and motivates farmers to adopt proven technologies for better livelihood in rural farming community. Extension activities and programs are planned and carried out by all staff of Agricultural Extension Division with step by step such as Head office, State or Regional level, District level and Township level. DOA at township level has main contact and carrying out extension services with rural farmers. Therefore, the purpose of this research is to examine township level DOA. First of all, working conditions, training, structure, objectives, programs, leadership, resources, procedure and personnel of DOA extension staff are considered. Networking conditions with Department of Agricultural Research, international government and non-government organizations and private sector, functions, problems and improvement for DOA are needed to examine for better understanding of township level DOA.

The main clients of extension staff are rural farmers and so farmers' perceptions on township level DOA are very important. Therefore, sample farmers' perceptions such as role of extension staff, quality attributes and strength and weakness of extension services and linkage with extension staff of DOA, precent of contact and non-contact farmers, contact area and reasons for no coordination are collected. Furthermore, factors influencing on contact frequency of sample farmers with DOA extension staff are also identified.

Partnerships, collaboration, and networking with research organizations and private sector are important aspects of pluralistic agricultural extension services. So, the perceptions of staff from DOA, DAR, NGO and private sector in study area on institutional management and system of DOA concerning with extension activities and services to farmers, linkage conditions with DAR, NGO and private sector are also included in local level institutional analysis on DOA. This conceptual framework of the study is shown in Figure 3.1.

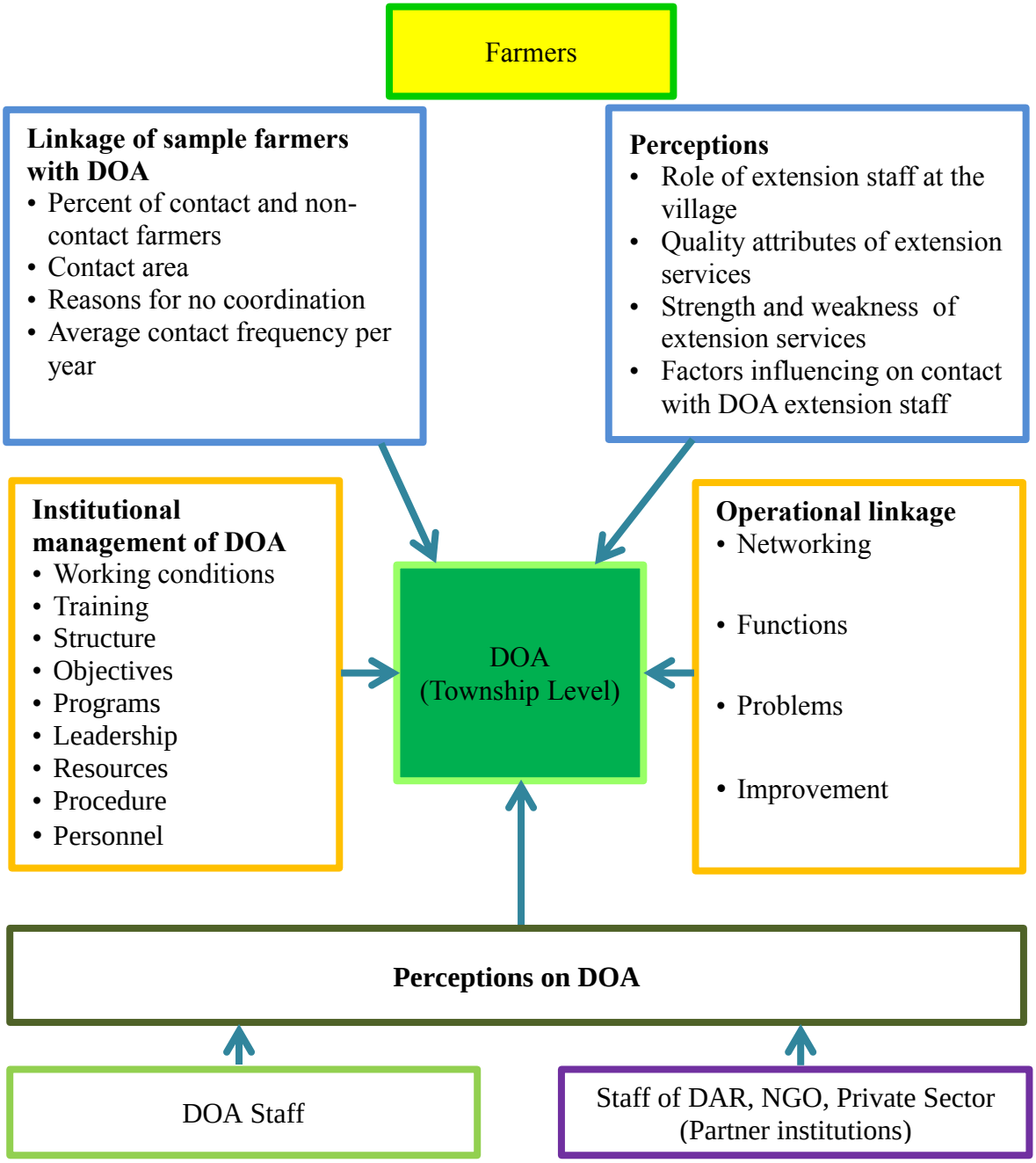

Figure 3.1 Conceptual framework of the study

3.2 Study Area

3.2.1 General description of the study area

The dry zone, a poverty-stricken area in Myanmar, occupies approximately 13 percent of the country's total land area. About 23 percent of the total population lives in this region, and the majority depend on agriculture and allied activities for their livelihoods. Sagaing Region which is in Dry Zone of Myanmar is located in the central part of the country, with low annual rainfall ranging from 700 to 1000 mm. The proportion of the rural population in Sagaing Region is also high (83%).

This study was conducted at Chaung Oo Township which is located in Monywa District, Sagaing Region. It is situated 231.46 feet (70.55 m) above sea level at north latitude 22° 45' and east longitude 95° 8' to 95° 25'. The total area of Chaung Oo is 493.63 km^2 with a population of 105,955 people and including 31 village tracts comprising 89 villages. There were 21,929 urban populations and 84,026 rural populations. Its official township boundary touches the boundaries of other townships: Myinmu is in the east, Myaung is in the south and south-east, Salingyi is in the west, and Monywa is in the north. The Chindwin River is in the west of the township and the town is six miles away from the river (GAD 2015).

3.2.2 Climatic condition of the study area

In the Dry Zone, rainfall is normally concentrated in the period May-October, with an intermediate dry period often occurring during June or July. The lengthy period without precipitation, relatively high average temperatures and generally light shallow soils are the key factors resulting in the semi-arid conditions and especially in the absence of irrigation, restrict agricultural potential.

Like in other areas of Myanmar, there are three seasons in Chaung Oo Township, namely summer (mid-February to mid-May), rainy season (mid-May to mid-October) and winter (mid-October to mid-February). The average temperature ranged from 25.78°C to 33.24°C and the highest temperature is 39.9°C that happened in April. Based on rainfall data, precipitation of 200.91 mm in maximum and 7.87 mm in minimum was found in September and February. Total raining days were 44 days and total precipitation was 738.63 mm in the year 2014. There was no precipitation in January, March and December (Table 3.1) (DOA 2015).

Table 3.1 Rainy days and precipitation of Chaung Oo Township in 2014

No.	Months	Rainy days	Total precipitation (mm)
1.	January	0	0
2.	February	1	7.87
3.	March	0	0
4.	April	2	20.57
5.	May	5	77.98
6.	June	5	48.01
7.	July	5	24.13
8.	August	11	149.35
9.	September	8	200.91
10.	October	5	107.70
11.	November	2	89.92
12.	December	0	0
	Total	44	738.63

Source: DOA (2015)

3.2.3 Land use pattern and main crops production in the study area

Chaung Oo Township occupied a land area of 120,684 ha and net sown area covered 77.94% of the total area (Figure 3.2). About 4.06% of total area is forest, 1.42% is wild land and 1.57% covered the other. In Figure 3.3, upland occupied 51.78 % of the agricultural land. Lowland, alluvial soil and orchard land comprised 29.61%, 18.60% and 0.01% respectively (DOA 2015).

Chaung Oo Township is located in Dry Zone, Myanmar and a variety of crops for upland are found to be major crops growing in the study township according to the land type in Dry Zone. Table 3.2 shows sown acreage, harvested area, yield and production of main crops grown by farmers in Chaung Oo Township. The upland crops such as green gram, sesame, pigeon pea, wheat, paddy, groundnut and cotton have been grown in Chaung Oo Township (Table 3.2). Dry Zone systems on all land types are characterized by a variety of forms of mixed cropping, intercropping, relay and phased plantings and rotations using a wide range of crops, representing skillful adaptation to low rainfall conditions (Kahan 2001). In Table 3.3, total sown area including net sown area, mixed cropping and relay cropping area and cropping intensity for Chaung Oo Township can be observed. Total sown area including net sown area, relay cropping area and mix cropping area was increased significantly from 100, 289 ha in 2013-2014 to 102,547 ha in 2014-2015 and cropping intensity was increased from 251% in 2013-2014 to 258% in 2014-2015 (DOA 2015).

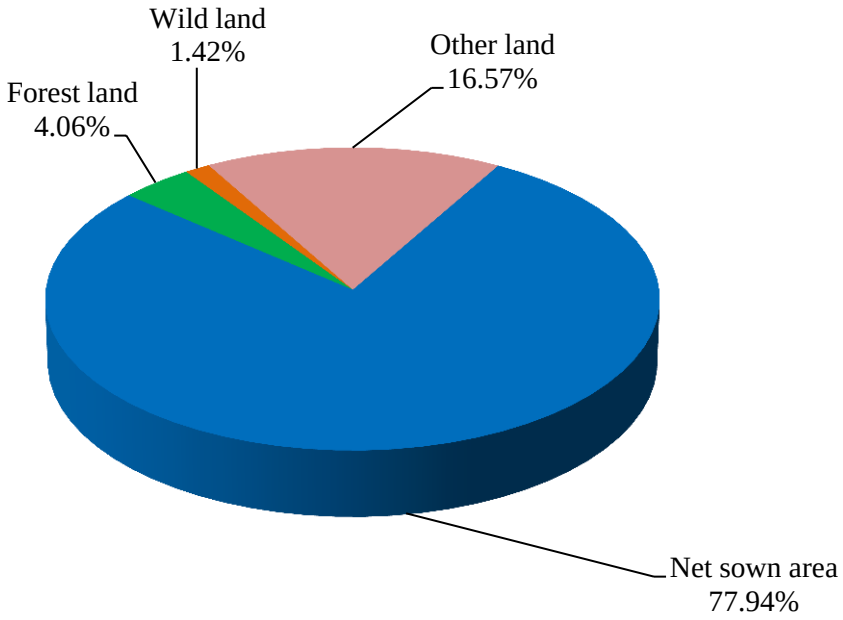

Figure 3.2 Land utilization in Chaung Oo Township (2014-2015)

Source: DOA (2015)

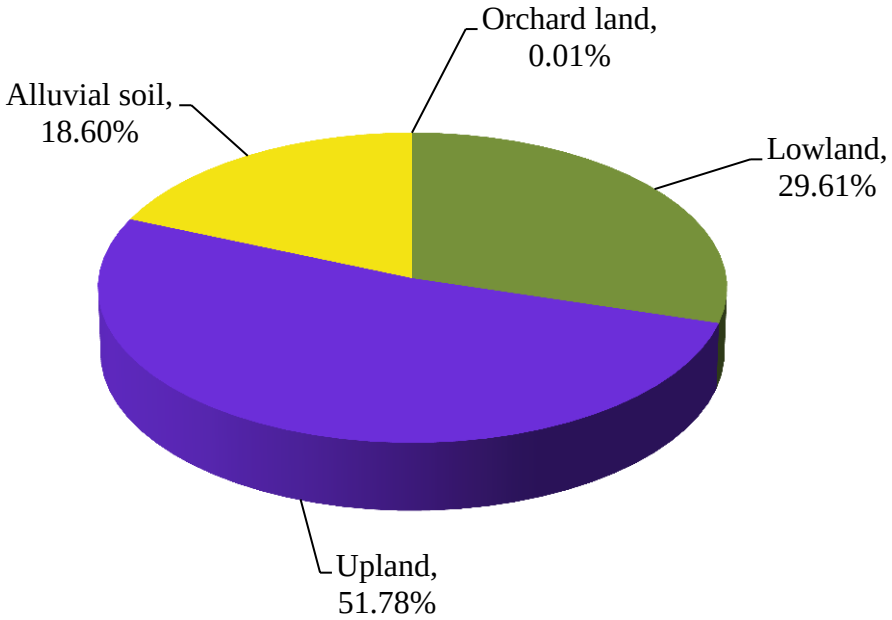

Figure 3.3 Agricultural land utilization in Chaung Oo Township (2014-2015)

Source: DOA (2015)

Table 3.2 Sown acreage and production of main crops in Chaung Oo Township (2014-2015)

Crops	Sown area ('000 ha)	Harvested area ('000 ha)	Yield (MT/ha)	Production ('000 MT)
Green gram (pre monsoon)	7.1	7.1	1.7	12.0
Green gram (monsoon)	5.1	5.1	1.3	6.6
Green gram (winter)	0.8	0.8	1.4	1.2
Sesame (monsoon)	0.9	0.9	0.3	0.3
Sesame (winter)	7.1	7.1	0.8	5.4
Pigeon	5.5	5.5	1.4	7.7
Wheat	7.7	7.7	1.8	14.2
Paddy	7.3	7.3	4.2	31.0
Groundnut (monsoon)	2.4	2.4	1.3	3.1
Groundnut (winter)	2.1	2.1	1.5	3.1
Cotton	2.2	2.2	0.7	1.5

Source: DOA (2015)

Table 3.3 Information on sown area by cropping system and cropping intensity in Chaung Oo Township

Item	2013-2014	2014-2015
Net sown area (ha)	40,023	39,784
Relay cropping area (ha)	32,414	37,051
Mix cropping area (ha)	27,852	25,713
Total sown area (ha)	100,289	102,548
Cropping intensity (%)	251	258

Source: DOA (2015)

3. 3 Data Collection and Sampling Procedure

Primary data collections as well as secondary data collection were done in this study. The survey was done in Chaung Oo Township during the period of September, 2015. To meet the research objectives, both of qualitative and quantitative data were collected. Although total strength of extension staff was 31, total numbers of respondents from DOA in the study was 28 including township staff officer. The reason was three staff served as volunteers in flooded area in other township during survey period (Figure 3.4).

Primary data were collected from 27 extension staff with semi structured interview. The collected data were demographic characteristics of the respondents, background information on work, training experiences, motivation and aspiration on extension, working conditions, types of extension methods used in study area, frequency of contact with research and private sector and NGO/INGO and qualitative data such as perceptions on working environment, extension work and linkage conditions. Key informant interviews with township staff officer from DOA, research officer (Zalote research farm, DAR), unit manager (Pact Myanmar Microfinance), two staffs from private agrochemical companies (Awba and Golden Lion), one output buyer, one processor, three owners of agrochemical retail shops were conducted to know their demographic characteristics, linkage conditions between DOA and DAR, private sector and NGOs/INGOs, perceptions on linkage of DOA, suggestions and comments on extension staff and institutional management of township level DOA.

Moreover, the purposive sampling procedure was used for selection of villages in study area. Total numbers of 77 sample farmers were selected with simple random sampling and interviewed with semi structured interview to obtain primary data such as demographic characteristics of the respondents, types of crops grown, coordination activities and contact frequency with DOA extension staff, reasons for not coordination, perceptions on quality attributes of extension services by DOA extension staff, strength and weakness of extension services from DOA, role of DOA extension staff. Moreover, focus group discussions with farmers were also done in seven villages to collect information and their opinions on DOA extension activities and services. It was expected that the group discussion would enable us to understand more institutional management of DOA and their extension activities (Table 3.4).

The names of the villages which are located equal to and over 5 miles distance from Chaung Oo town were Taw Kyaung Kyi, Tone Pan Hla, Nwe Chway. On the other

hand, Aung Chan Thar, Kin Moon Taw, Pae Pyit Taw and Nga Shan were located within 5 miles from town. Cultivable land type such as lowland and kaing could be found in Taw Kyaung Kyi, Tone Pan Hla and, Kin Moon Taw villages. Only upland type exists in New Chway and Nga Shan villages and lowland and upland type are found in Aung Chan Thar, and Pae Pyit Taw villages (Table 3.5). Map of township and sample villages are shown in Appendix 1.

Secondary data were gathered from various sources such as several books, research literatures, articles, journals, thesis, official records of Ministry of Agriculture, Livestock and Irrigation (MOALI) and other related publications.

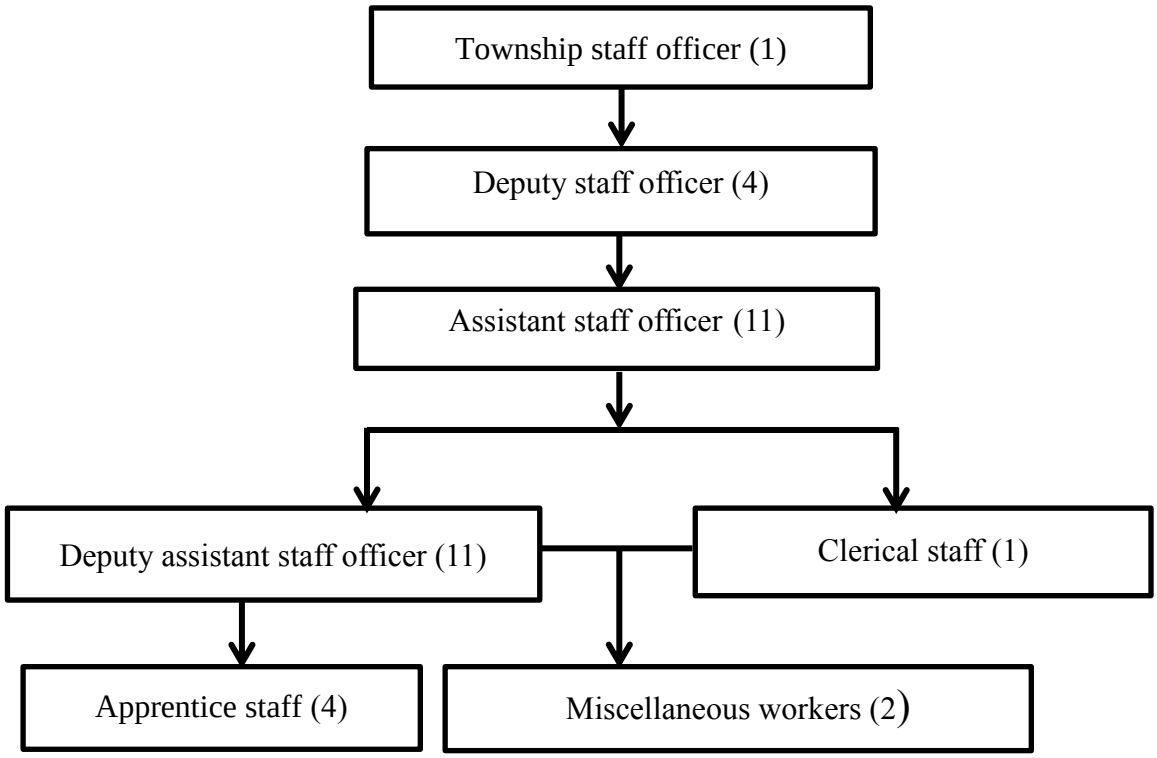

Figure 3.4 Organizational structure of DOA, Chaung Oo Township (2014)

Source: DOA (2015)

Table 3.4 Research methods for this study

Item	Interview method	Types of respondent	No. of respondents
DOA, township office	KII	Township staff officer	1
	SSI	Extension staff (Field)	23
		Extension staff (Planning)	4
DAR	KII	Research officer	1
NGO	KII	Staff	1
Private sector	KII	Output buyer	1
		Staff from agrochemical company	2
		Processor (Oil miller)	1
		Agrochemical retail shop	3
Seven villages	SSI	Farmers	77
	FGD	Farmers (Group)	7
Total number of respondents			114

Note: KII = Key Informant Interview, SSI = Semi Structured Interview, FGD = Focus Group Discussion

Table 3.5 General features of selected villages in Chaung Oo Township

Village distance from town	Name of village	Cultivable land (ha)			No. of farmers
		Lowland	Kaing	Upland	
≥ 5 miles	Taw Kyaung Kyi	298	671	-	1,360
	Tone Pan Hla	293	830	-	1,339
	Nwe Chway	-	-	2,739	1,032
< 5 miles	Aung Chan Thar	193	-	411	859
	Kin Moon Taw	202	304	-	1,281
	Pae Pyit Taw	28	-	486	821
	Nga Shan	-	-	2,428	1,710

Source: DOA (2015)

3.3 Method of Analysis

3.3.1 Descriptive analysis

Descriptive statistics such as frequency, percentage, mean, minimum and maximum were used to analyze quantitative data: the socio-economic characteristics of respondents including age, educational level, family background, working conditions of extension staff (for example, number of assigned villages, number of contact farmers, field visit to assigned villages), frequency of contact per year between two institutions. Besides, qualitative data such as perception of staff from DOA, DAR, private sector and NGO/INGO on linkage and institutional management and system of DOA, perception of sample farmers on DOA extension services such as role of extension staff, strength and weakness of extension services, quality attributes of extension services were identified by descriptive methods.

3.3.2 Multiple regression analysis

Regression analysis is one of the most commonly used tools in econometric studies. Regression analysis is a statistical tool for the investigation of relationships between variables. Multiple regression models are now a mainstay of statistical analysis in most fields because of its power and flexibility. Multiple regressions is a technique that allows additional factors to enter the analysis separately so that the effect of each can be estimated. It is valuable for quantifying the impact of various simultaneous influences upon a single dependent variable. The general purpose of multiple regression analysis is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable. In the study, a multiple regression model was used to find out the influencing factors on contact frequency of sample farmers with DOA extension staff per year by using some selected socio-economic variables and dummy variables. This model was as follow:

Contact frequency function

$$C_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 D_{1i} + \beta_7 D_{2i} + \beta_8 D_{3i} + \beta_9 D_{4i} + \beta_{10} D_{5i} + \mu_i$$

Where,

C_i = Contact frequency of sample farmers with DOA extension staff (times/year)

X_{1i} = Household head's age (Years)

X_{2i} = Household head's education level

X_{3i} = Household size (Numbers)

X_{4i} = Family labor (Numbers)

X_{5i} = Farm size (Hectares)

D_{1i}= Dummy for paddy farmers (Yes = 1, Otherwise = 0)

D_{2i}= Dummy for member in any organization (Yes = 1, Otherwise = 0)

D_{3i}= Dummy for contact with private sector (Yes = 1, Otherwise = 0)

D_{4i}= Dummy for village distance from the town (Less than 5 miles = 1, Otherwise = 0)

D_{5i}= Dummy for coordination activities with DOA (Yes = 1, Otherwise = 0)

β_o = Constant

β_1 to β_{10} = Regression coefficients

μ_i = Error term

Source: Haq (2012)

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Description of All Extension Staff from DOA, Chaung Oo Township

4.1.1 Demographic characteristics of all extension staff

Duties and responsibilities of township staff officer (TSO) and deputy staff officers (DSO) are near the same, so they can be included in one group (TSO/DSO group). According to the duties, responsibilities and service rank, assistant staff officers (ASO) and deputy assistant staff officers (DASO) can be grouped separately. Apprentice staff (AS) might be omitted from grouping because they were very junior staff. The average age of TSO/DSO group was about 50 years old. The average age of ASO group and DASO group were above 30 years old. The average age of all extension staff was 35 years with the youngest 21 years old and the oldest 59 years. Regarding the gender, % of female extension staff was higher than that of male extension staff in TSO/DSO group. Similarity, female extension staff was more dominate in ASO group and DASO group. For all extension staff, female was 71% and male was 29%. In terms of marital status, most extension staff was married in TSO/DSO group and most were single in ASO and DASO group. Concerning with all extension staff, single (58%), married (39%) and windowed (3%) of extension staff were found. According to education level, most staff were diploma holders from State Agriculture Institute in TSO/DSO group, ASO group and DASO group.

Most of extension staff were diploma holders from State Agriculture Institute and it was constituted as a higher percentage of all extension staff (84%). Education level of 3% of all extension staff was agricultural high school. Only a few percent of extension staff were graduated from Yezin Agricultural University (13%). Almost extension staff in TSO/DSO group, ASO group and DASO group had rural farming background. In family background of all extension staff, 77% of staff's parents were farmers, government staff (16%) and merchant (7%) respectively (Table 4.1).

4.1.2 Background information on work of all extension staff

In Table 4.2, average service years for all extension staff varied according to positions. It can be observed that average service year for TSO/DSO group was nearly 30 years old, 11 years for ASO group, and 3 years for DASO group. Average service years for all extension staff was 8 years with minimum 0.5 year and maximum 39 years. Places of residence for all extension staff in study area also examined. Most of all extension staff lived in other villages (42%) and only 6% of all extension staff lived in assigned village,

26% of them lived in Chaung Oo Township and on other townships respectively. About half of extension staff in TSO/DSO group lived in other villages and in Chuang Oo Township. Most extension staff in ASO group lived in other township, those in DASO group lived in other villages.

4.1.3 Trainings attendance and training experiences of all extension staff

To perform a job better, training is the process of acquiring specific skills to upgrade the quality of human resources. Usually an institution facilitates the clinteltes' learning through training experience to improve their modified behaviour which contributes to the achievement of the organization/institution's goals and objectives.

Average number of trainings attended by TSO/DSO group and ASO group were 3 but average number of trainings attended by DASO group was 2 in their total service years. Regarding all extension staff, average number of trainings was 2 with minimum 0 and maximum 5 (Table 4.3). Moreover, Figure 4.1 shows training experiences of extensions staff on different types of trainings for their improvement of technical knowledge. 83% of staff had pre-service training experience because it was compulsory training for them. Field crop production training was in second place (25%) and it can be seen that training emphasis was placed on field crop production. Other common types of training were trainings on soil and water and rural development (21%) respectively. Moreover training experiences of staff on post-harvest technology, inorganic and organic fertilizer and management and finance were the same (13%). On the other hand, in service training (8%), seed technology (8%) and plant protection (4%) trainings were in few (Figure 4.1).

Table 4.1 Demographic characteristics of all extension staff from DOA, Chaung Oo Township

Item	Position					
	TSO (N = 1)	DAO (N = 4)	ASO (N = 11)	DASO (N = 11)	AS (N = 4)	All (N = 31)
Age (Year)						
Average	54	49	37	30	22	35
Maximum	0	59	44	34	24	59
Minimum	0	41	27	23	21	21
Gender (%)						
Male	0	50	27	36	0	29
Female	100	50	73	64	100	71
Marital status (%)						
Single	0	25	64	54	75	58
Married	0	75	36	36	25	39
Widowed	100	0	0	0	0	3
Education level (%)						
Agricultural High School	0	25	0	0	0	3
Dip.in Agric.	0	50	100	82	100	84
B.Agr.Sc	100	25	0	18	0	13
Parents' job (%)						
Farmers	100	50	73	91	75	77
Merchant	0	25	9	0	0	7
Government staff	0	25	18	9	25	16

Note: TSO = Township Staff Officer, DSO = Deputy Staff Officer, ASO = Assistant Staff Officer, DASO = Deputy Assistant Staff Officer, AS = Apprentice Staff

Table 4.2 Background information on work of all extension staff from DOA, Chaung Oo Township

Item	Position					
	TSO (N = 1)	DSO (N = 4)	ASO (N = 11)	DASO (N = 11)	AS (N = 4)	All (N = 31)
Total service years in DOA						
Average	30	24	11	3	1	8
Maximum	0	39	27	5	2	39
Minimum	0	16	4	1	0.5	0.5
Place of residence (%)						
Assigned village	0	0	18	0	0	6
Other village	0	50	18	64	50	42
In township	100	25	18	18	50	26
Other townships	0	25	46	18	0	26

Table 4.3 Trainings attendance of all extension staff from DOA, Chaung Oo Township

No. of trainings	Position					
	TSO (N = 1)	DSO (N = 4)	ASO (N = 11)	DASO (N = 11)	AS (N = 4)	All (N = 31)
Average	3	3	3	1	0	2
Maximum	0	5	5	2	0	5
Minimum	0	2	2	0	0	0

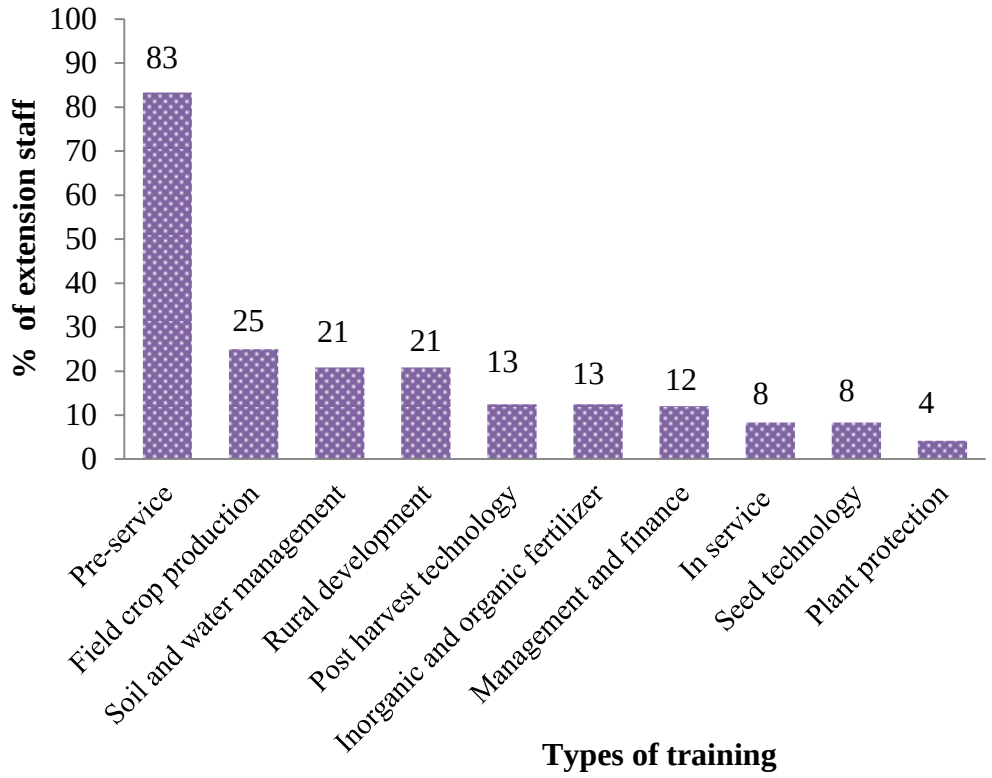

Figure 4.1 Types of training attendance of extension staff, Chaung Oo Township

4.1.4 Ways of updating technological knowledge and knowledge on extension approach

It is necessary for extension staff to upgrade their technical knowledge in order to give useful and up to date information to their clients, and rural farmers. In Figure 4.2, common ways of updating technological knowledge were training experiences (52%) and learning from radio and TV (48%) and internet sources (37%). At the same time, 26% of extension staff improved their technological knowledge through publications and 11% updated by practical field observation. In examining awareness of knowledge on extension approach, 74% of extension staff had awareness on Participatory Extension Approach (PEA) and 26% had no awareness on that approach (Figure 4.3).

4.1.5 Extension staff's aspirations on job and motivation for personal improvement

Table 4.4 reveals different aspirations of extensions staff on their job and motivation for further study. Most staff expected to get high position (45%) in their job, whereas 33% of staff intended to run a private agricultural enterprise. On the other hand, 11% of each respondents had the ambitious for further study in abroad and to have competency in work. Only 41% of respondents had motivation for further study to upgrade their education level and other 59% had no motivation to upgrade their academic background.

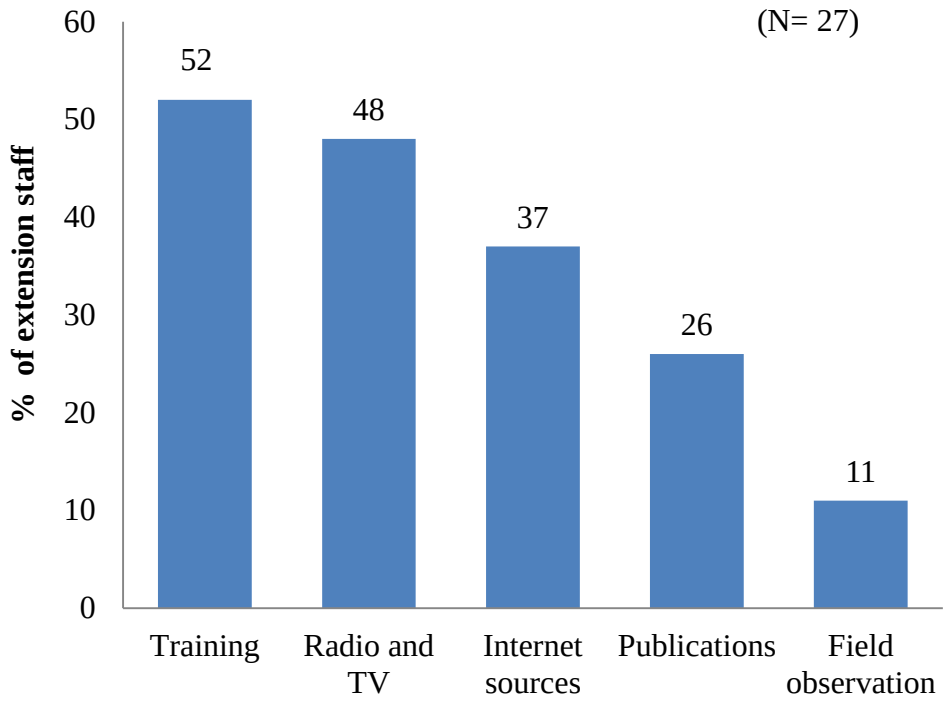

Figure 4.2 Ways of updating technological knowledge by extension staff

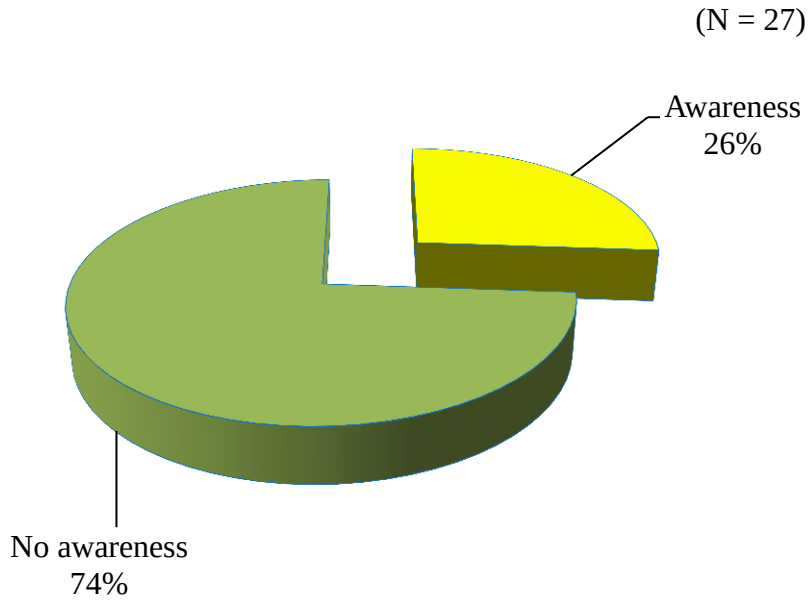

Figure 4.3 Awareness of extension staff on participatory extension approach

Table 4.4 Extension staff's aspirations on job and motivation for further study

Item	Position (%)				
	DSO (N = 4)	**ASO (N = 10)**	**DASO (N = 9)**	**AS (N = 4)**	**All (N = 27)**
Aspiration					
To get high position in DOA	25	40	67	25	45
To go aboard for further study	0	0	0	75	11
To have competency in work	25	10	11	0	11
To run a private agricultural enterprise	50	50	22	0	33
Motivation for further study					
No motivation	75	70	56	25	59
Motivation	25	30	44	75	41

4.2 Working Conditions of Field Extension Staff with Clients

4.2.1 Duties of field extension staff in assigned area

Assigned villages for individual field extension staff was 5 villages in average with minimum 1 village and maximum 26 villages. Each field extension staff had 10 contact farmers in average with minimum 4 and maximum 30. Regarding field visit of field extension staff, 52% of staff had regular visit to assigned area and 48% visited only in crop season (Table 4.5). Based on the facts mentioned above, 26% of staff was able to contact with more than 50% of total their clients, farmers. About sixty one percent of staff was able to contact with about 50% of farmers and 61% was able to contact with about 50% of total farmers in assigned area (Figure 4.4).

As the clients of the extension staff are farmers, there must be closed and familiar contacts between farmers and extension staff. Demonstrations are effective educational tools in introducing various new technologies to the farmers and its adoption by building confidence on the basis of results obtained from their field demonstration. Therefore, survey' result found that main reason for contacting with farmers was to conduct, and observe demonstration (78%). Concerning with the collection of data and information, agricultural agencies may require statistical data for planning purposes. Extension staff should collect data and information which are essential to extension work, therefore the second main reason for contacting with farmers was recording and data collection (61%). Another function of extension staff was to provide suitable inputs required for farmers and so third main reason for contacting with farmers was to provide quality seed (39%). In providing extension services to farmers, it is essential to get mutual trust between extension staff and their clients, so other reason to contact with farmers was to create dealing for more with socialization (30%). The extension staff contacted with farmers when they accompanied other responsible government officials according to the implemented agricultural policy. One of the main reasons was farmers was to accompany with other responsible persons in field visits (30%) (Figure 4.5).

It is obvious that the extension staff have contact with other people in their working environments besides their clients and have coordination activities for rural development. Village heads play as important persons in organizing rural people for village development activities and most of the extension staff contact with village head (87%). Extension staff have coordination activities with other government staff who are responsible for rural development. Extension field staff contacted with other government staff (74%) and 9% of staff contacted with respectable person such as the Buddhist monks (Figure 4.6).

Table 4.5 Number of assigned villages, contact farmers and field visits of field extension staff

Item	Position				
	DSO (N = 4)	ASO (N = 9)	DASO (N = 6)	AS (N = 4)	All (N = 23)
Assigned villages					
Average	14	4	4	1	5
Maximum	26	7	5	2	26
Minimum	4	2	3	1	1
No. of contact farmers					
Average	10	13	8	6	10
Maximum	15	30	15	10	30
Minimum	6	5	4	4	4
Field visit (%)					
During crop season	25	56	50	50	48
Regular	75	44	50	50	52

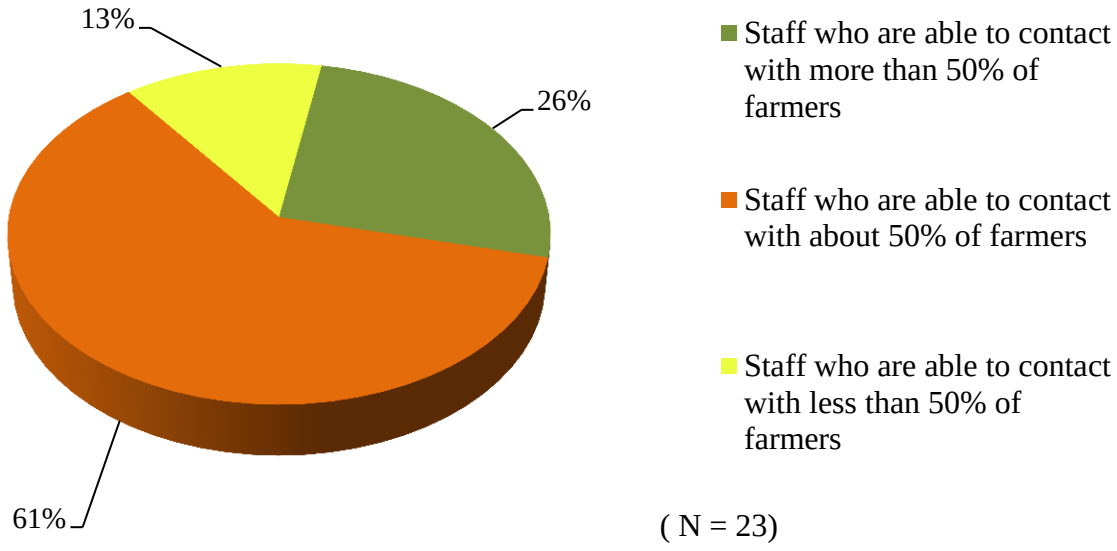

Figure 4.4 Field extension staff who were able to contact with farmers for extension activity in assigned area

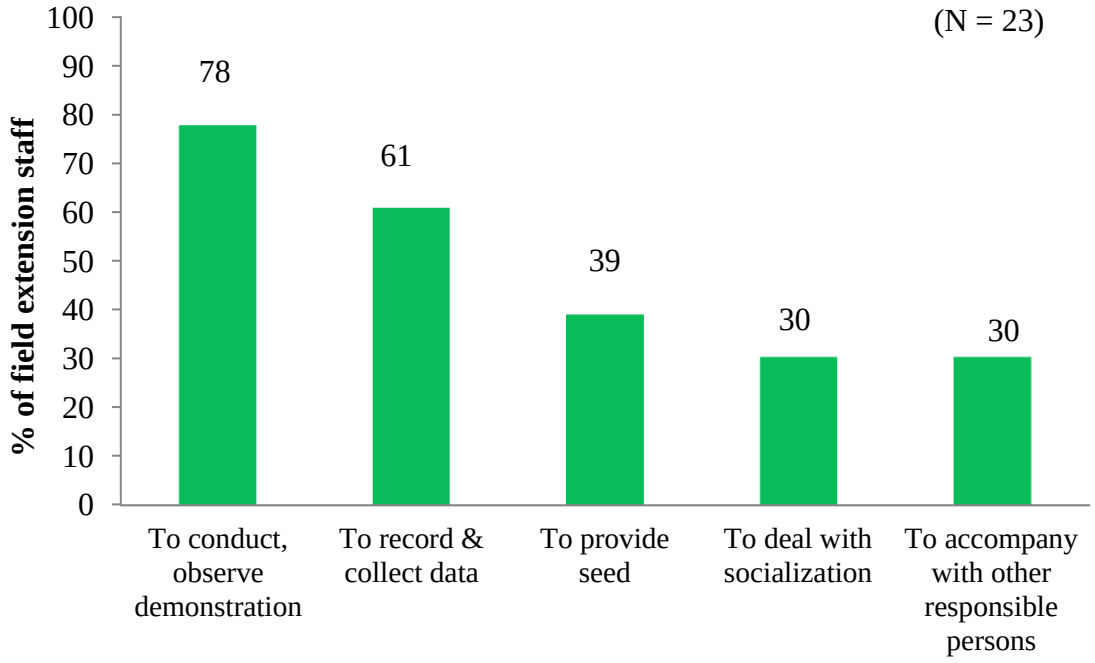

Figure 4.5 Main reasons for contacting with farmers

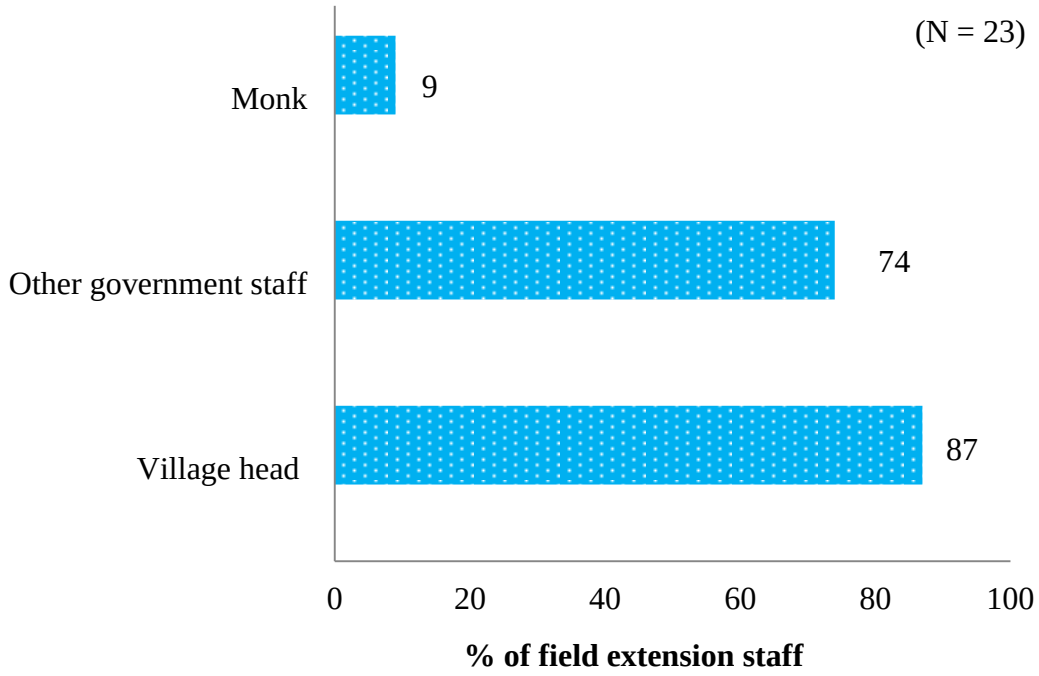

Figure 4.6 Contact persons besides clients of field extension staff in assigned area

4.2.2 Different kinds of extension method used by field extension staff

As Myanmar agricultural extension service is categorized under the traditional extension approach, it is needed to identify the common practices of extension method or technique used in the study area. Common methods used by field extension staff were group meeting at specific village tract (100%) and farm and home visit (100%), followed by demonstration (83%). Although media is an effective method, media such as pamphlets were used by only 35% of extension staff. Field day was used by a few percent of staff (26%). Although farmers field school training programs help farmers develop analytical skills, critical thinking, and creativity, and learn to make better decisions, this method was used by a few percent of staff (13%) (Table 4.6).

Table 4.6 Types of extension method used by field extension staff

Methods	Position (%)				
	DSO (N = 4)	**ASO (N = 9)**	**DASO (N = 6)**	**AS (N = 4)**	**All (N = 23)**
Group meeting at village tract	100	100	100	100	100
Farm and home visit	100	100	100	100	100
Demonstration	25	100	100	75	83
Mass media	75	33	0	0	35
Field day	0	56	17	0	26
Farmer field school	0	11	33	0	13

Note: Total percent may not equal to 100 because respondents can answer more than one item.

4.3 Linkage of DOA, Chaung Oo Township with Partner Institutions

4.3.1 Extension linkage with DAR, private sector and NGO/INGO

To provide an effective extension service, extension institutions must have two way communication linkages with research institutions and international and national non-government organizations. Field extension staff had contacts with different institutions but it was found that more coordination and cooperation are needed among and between institutions. Fifty two percent of field extension staff had contacts with DAR. Moreover, field extension staff had contact with private sector (35%) and NGO/INGO (26%) (Figure 4.7). Average frequency of contacts between field extension staff and DAR as well as private sector was 2 times per year and average contact frequency between staff and NGO/INGO was one time per year (Table 4.7).

4.3.2 Reasons of making linkage between DOA and DAR

Table 4.8 shows reasons of making linkage between DOA and DAR based on survey results. Regarding with linkage between DOA and DAR, 81% of staff perceived that making linkage with DAR was needed. Most staff perceived that linkage was needed to do more cooperation, and exchange of experiences between DOA and DAR at the township level (38%), to get quality seeds and new variety sufficiently (35%) and to receive technological information of crops and variety in detail (32%). Moreover, some staff described more contacts with DAR to learn specific cultural practices by crops (15%) and to conduct yield trials jointly more than before (12%).

In key informant interview, 54 years old, female township staff officer of DOA perceived that DOA and DAR needed more contacts and more coordination in close observation and making suggestions on joint field trials. DOA staff needed to get detail information on crop variety for more convenient in carrying out farm trials. Perception of 55 year old, male, research officer of DAR was the need to be strong linkage between extension-farmers-research (Figure 4.8).

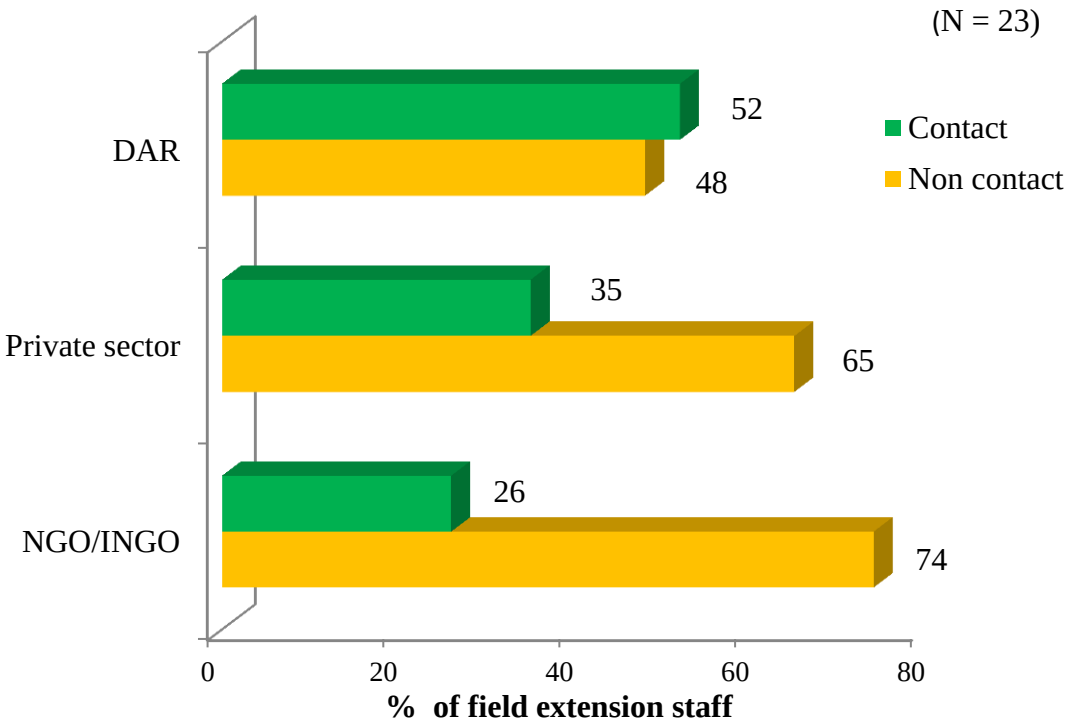

Figure 4.7 Linkage between field extension staff and partner institutions

Table 4.7 Frequency of contact per year between field extension staff and partner institutions

Item	Types of institution		
	DAR (N = 12)	Private sector (N = 8)	NGO/INGO (N = 6)
Average	2	2	1
Maximum	3	4	2
Minimum	1	1	1

Table 4.8 Needs to have linkage between DOA and DAR (N = 27)

Staff's perception on linkage	No. of staff
Need	22 (81)
No need	5 (19)
Reasons for having linkage	
To cooperate and exchange of experiences	10 (38)
To get quality seed and new variety sufficiently	9 (35)
To receive information about crops and variety in detail	7 (32)
To provide specific cultural practices by crops	4 (15)
To conduct yield trials	3 (12)

Note: 1.Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

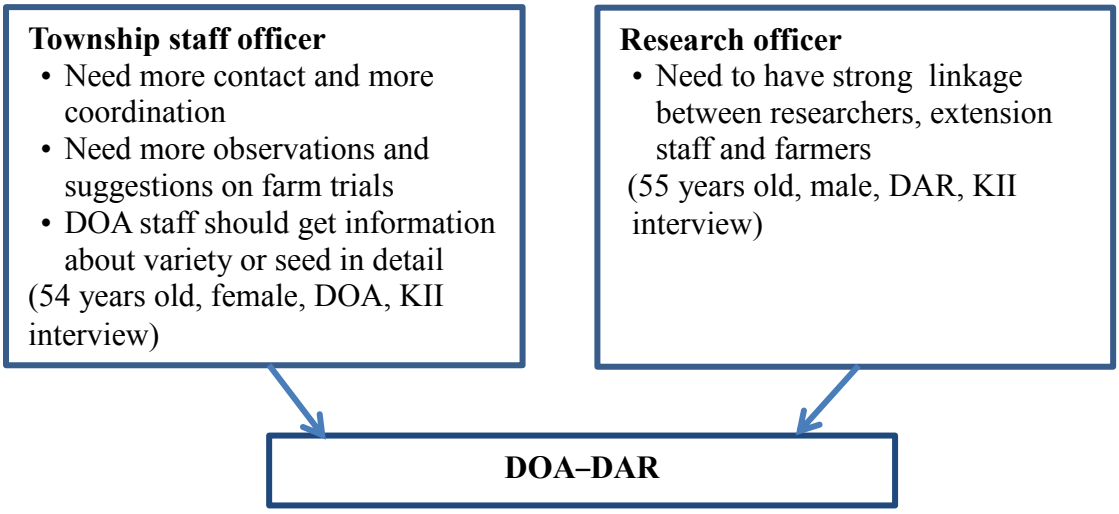

Figure 4.8 Perceptions of township staff officer and research officer on linkage between DOA and DAR

4.3.3 Perceptions of respondents from DOA and NGO on linkage between DOA and NGO/INGO

According to the perceptions of DOA township staff officer (54 years old, female) and unit manager (41 years old, female) from Pact Myanmar Microfinance, two institutions had no collaboration in giving extension services to farmers and had a few contact in giving some data such as total loan per year. Although DOA had some contacts and coordination with other NGO/INGO in conducting joint project on farmers' fields, the DOA (township level) needed to have more collaboration with local and international organizations. Perception of the staff officer was that NGO/INGO needed to give more supporting to farmers not only improve crop variety or seed but also some parts of production cost because farmers require more labor in conducting projects activities. Therefore it was required to receive feedback information from NGO/INGO regarding joint projects such as varietal testing (Figure 4.9).

4.3.4 Perceptions of respondents from DOA and private sector on linkage between DOA and private sector

According to key informant interview, perception of staff officer (54 years old, female) was that DOA in Chaung Oo Township didn't connect with agrochemical companies because of their different institutional objectives. Township staff officer and respondents from agrochemical retail shops (45-28 years old, all male) had same perception such as the DOA staff contacted agrochemical retail shops in the case of license issuing for agrochemical sale, Certificate of Pesticides Application (CPA) trainings and quality check of agrochemical products (Figure 4.10).

Perceptions of two staff from two private agrochemical companies (30 years old and 34 years old, male) were they had not formal contact with DOA and no coordination in giving extension services to farmers. The reason was that they had not same business in two institutions. They had a few personal contacts with friends from DOA for getting township profile and sown acres by crops and in discussion on agrochemical products. Output buyer (52 years old, male) responded that there was a few contact with DOA in buying and selling of products. Oil miller (56 years old, male) said that there was no contact with DOA (Figure 4.10).

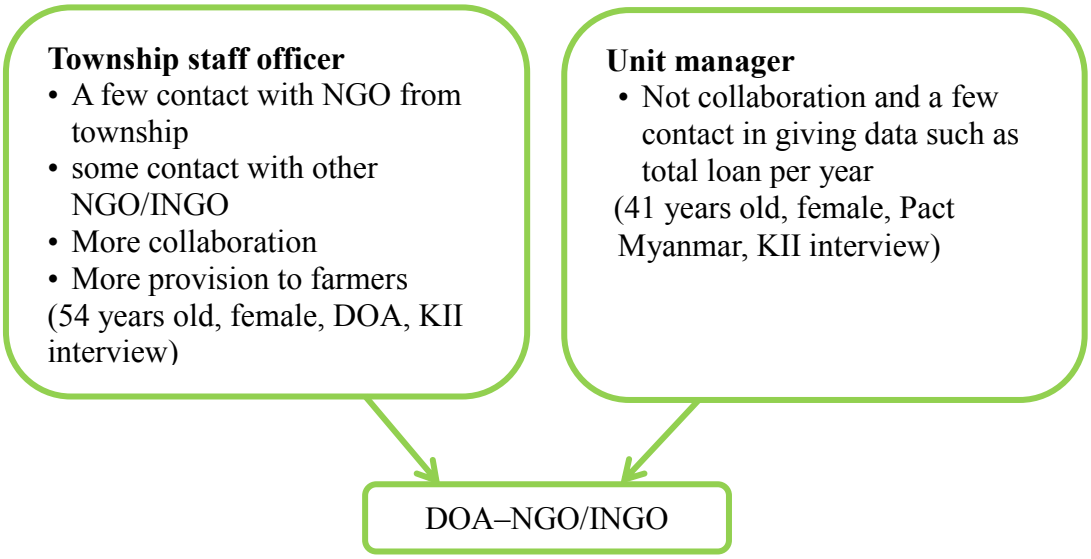

Figure 4.9 Perceptions of township staff officer and unit manager on linkage between DOA and NGO/INGO

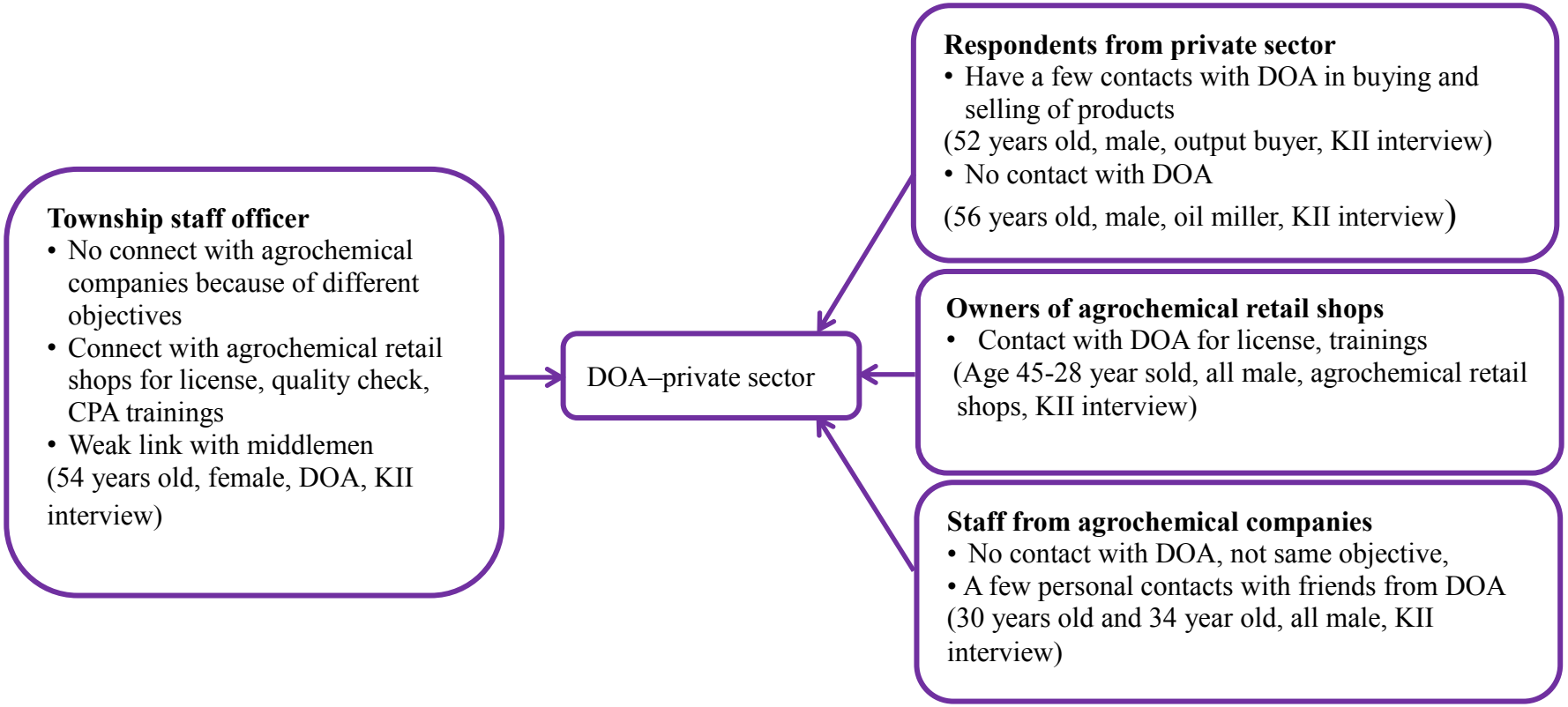

Figure 4.10 Perceptions of township staff officer and respondents from private sector on linkage between DOA and private sector

4.4 Opinions of Extension Staff on Working Environment and Extension Work

4.4.1 Extension staff's perceptions on working environment

How extension staff perceived on their working environment in study area was examined. According to their responses, 33% of staff perceived that they had top down linkage with their supervisor. Most staff described that they received equal assigned duties (74%) and other 26% didn't get equal workload in assigning duties. Moreover, most staff from township level (56%) received uneven opportunity among same level of staff from DOA and promotion system was not based on working performance (48%). They agreed that they had group discussion about extension work (85%) and on the other hand, 15% though that they had no discussion on work among staff (Table 4.9).

4.4.2 Perceptions of extension staff on the problems of extension work

It is also needed to find out the problems faced by extension staff in carrying out different extension activities. In Table 4.10, the scale values of the extension staff' perceptions on their work are shown in descending order. In each item, four levels of the staff' perceptions namely strongly agree, agree, disagree and strongly disagree were given as their indications, and the scaling was done by assigning 4, 3, 2 and 1, respectively. Mean value of 3 and above indicated that the respondents agreed on lack of suitable market and price, no incentive for extension staff, budget constraints, and poor transportation facilities. They also agreed that numbers of extension staff were inadequate and too many farmers to give advice for doing extension work effectively. Another problem faced by extension staff was little trust of farmers on DOA and most farmers are illiterate.

Table 4.9 Extension staff's perceptions on working environment (N = 27)

Statement	%		
	Think	Don't think	No idea
Top down linkage with supervisor	33	59	8
Equal assigned duties in organization	74	26	0
Equal opportunity among same level of staff	37	56	7
Promotion is purely based on work performance	45	48	7
Discussion among staff about work	85	15	0

Table 4.10 Extension staff's perceptions on the problems of extension work (N = 27)

Perceived problems	Mean
Lack of suitable market and price	3.35
No incentive for extension agents	3.23
Budget constraints	3.19
Poor transportation facilities	3.15
Inadequate number of extension staff	3.12
Too many farmers to give advice	3.08
Little trust of farmers	3.04
Most farmers are illiterate	3.04
Most farmers are not interested	2.92
Few cooperation of local people in program implementation	2.77
Most farmers are not motivated	2.73
Most farmers are very conservative	2.69
Sometimes delay in implementing extension activities due to poor administration	2.42
Most of extension programs are not related to the local needs	2.41

Note: Scales: 4= Strongly agree, 3= Agree, 2= Disagree, 1= Strongly disagree

4.5 Perceptions of Respondents from Different Institutions on Institutional Management and System of Township Level DOA

4.5.1 Perceptions of respondents from DOA, DAR and NGO

Key informant interviews were conducted to examine the perceptions of respondents from DOA, DAR and NGO on institutional management and system of township level DOA. Township staff officer (54 years old, female, Department of Agriculture) perceived that only some farmers participated in extension activities and interested on technologies given by DOA because they assumed that technologies given were not practically useful and suitable to their local conditions. DOA should carry out more contacts and activities with farmers because farmers believe on seeing themselves and it is needed to build mutual understandings between extension staff and their clients. More provisions such as inputs or credit to farmers especially in carrying out extension activities such as group meeting and demonstration and variety trial are necessary in current extension system. On the side of extension staff, they need more training experiences to improve and update their technological knowledge and it is needed to upgrade the education level of staff. Moreover, more supporting to staff such as adequate travelling allowance, mobility provision are necessary to create the motivation of them (Figure 4.11).

Perception of unit manager (41 years old, female, Pact Myanmar Microfinance) was that it is needed to strong the strength of staff and to have more contact with farmers and filed visits to their farms. Rural farmer need more credit because agricultural loans from Myanmar Agricultural Development Bank was not enough. According to the perception of research officer (55 years old, male, DAR), DOA staff should supervise field trials carefully and it is essential to know farmers' conditions and their needs more closely and precisely (Figure 4.11).

4.5.2 Perceptions of respondents from private sector

Perceptions of output buyer, respondents from agrochemical retail shops and agrochemical companies were DOA need to have close contact and conduct group meeting with farmers carefully. Moreover, DOA extension activities should be accompanied with provision of inputs to farmers for persuading them in these activities, for example, group meeting. Most farmers still use traditional techniques in their crop production and they had weak knowledge in post-harvest technologies and agrochemicals usage. It is really needed for farmers to know and to use modern new technologies and information on agrochemicals such as how to use and how to apply more effectively.

Moreover, it is necessary to distribute quality seed adequately and farmers need more credit for their crop production, suitable market and price. Some DOA staff needed experience in contacting and dealing with farmers (Figure 4.11).

4.6 Comments and Suggestions of Extension Staff on Improving Extension at Township Level

Extension staff's different perceptions on improving agricultural extension can be seen in Table 4.11. Most DOA staff perceived that the capacity of staff were needed to upgrade, thus they needed more training experiences and update technological knowledge (96%). In addition, 78% of staff suggested that DOA should provide local specific technologies, improved seeds and varieties to farmers adequately. They also perceived that provision of credit or inputs to farmers was essential for persuading their participation and to get interest in extension activities because DOA staff had nothing to give input resources to farmers in carrying out extension activities (70%). Some staff's comments were DOA should have more contact activities and carry out demonstration with farmers (41%), more effective extension strategies and system (15%) and suitable market for crop (15%).

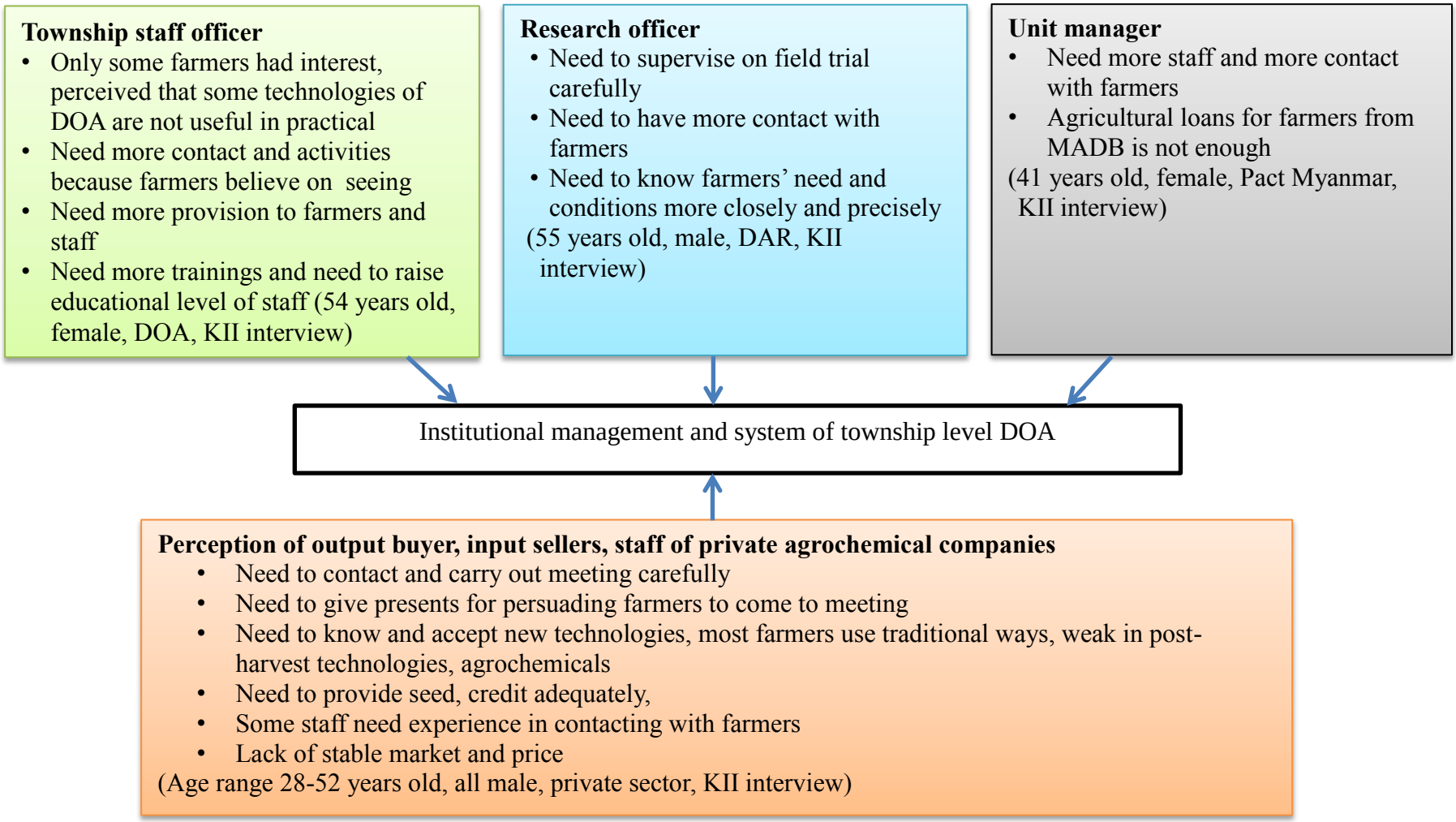

Figure 4.11 Perceptions of respondents from DOA and partner intuitions on institutional management and system of township level DOA

Table 4.11 Extension staff's perceptions on improving agricultural extension at township level (N = 27)

Perception	No. of staff
Need to upgrade the quality of extension staff by conducting trainings	26 (96)
Need to provide adaptable technologies, improved seeds adequately	21 (78)
Need to provide credit or inputs for persuading farmers for involving in extension activities	19 (70)
Need to have more contacts with farmers and to carry out suitable extension activities such as group meeting, demonstration	11 (41)
Need to have market for crop	4 (15)
Need to find more effective extension strategies and system	4 (15)

Note: 1. Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

4.7 General Information of Sample Farmers

4.7.1 Demographic characteristics of sample farmers

Age is one of demographic characteristics that are important to describe about the respondent situations and acceptability's of extension services and activities. According to the results in Table 4.12, the average age of sample was 49 years with minimum 20 years maximum 65 years Farm experiences of sample farmers were 26 years ranging from 2 years to 45 years. In this study, the average total family size was 4 persons ranging from 2 to 7 persons. Household members who involved in farm were considered in this study. The average number of family labor was 3 persons with minimum 1 person and maximum 6 persons. Farmers in study area owned 3 ha of average total farm size ranging from 1 ha to 11 ha. According to land type, sample farmers possessed 2 ha of upland in average with maximum 8 ha. In lowland, sample farmers had 2 ha in average ranging from 0 ha to 8 ha. Based on results, they also had 1 ha of other land type in average with maximum 6 ha.

4.7.2 Education level of sample farmers in study area

In planning extension system and strategies, the education level of farmers should also be considered. Findings reveal that 58% of sample farmers had primary education which was the highest percent in this study. Secondary education was found as the second highest percent for sample farmers (21%). Twelve percent of sample farmers had monastery education level. Moreover, only a few percent of sample farmers had high school and graduated educational level (6% and 3% respectively) (Table 4.13).

4.7.3 Common crops grown by sample farmers in study area

According to Table 4.14, sample farmers cultivated paddy (71%), followed by chickpea (43%) and groundnut (42%). Others crops cultivated by sample farmers were green gram (25%), sesame (39%), pigeon pea (38%), wheat (17%), cotton (17%), and corn (6%) respectively.

4.7.4 Participation of sample farmers in various organizations

Table 4.15 explains participation status of sample farmers in different organizations. Among the sample farmers, 58% were concerned with organizations and 42% of them were not involved in any organizations. Out of sample farmers who participated in organization, majority of farmers were participated in social religious groups due to their local tradition. Twenty percent of participant farmers were integrated in administrative groups and 17% in cooperatives. Farmers group (7%) and water user group (9%) were also formed by few percent of farmers.

Table 4.12 Demographic characteristics of sample farmers (N = 77)

Item	Unit	Average	Maximum	Minimum
Age	(Years)	49	65	20
Farm experience	(Years)	26	45	3
No. of household members	(Numbers)	4	7	2
No. of family labor	(Numbers)	3	6	1
Total farm size	(ha)	3	11	1
Upland farm (ha)	(ha)	2	8	0
Lowland farm (ha)	(ha)	2	8	0
Others land (ha)	(ha)	1	6	0

Table 4.13 Education level of sample farmers in study area (N = 77)

Education level	No. of sample farmers
Monastery	9 (12)
Primary	45 (58)
Secondary	16 (21)
High school	5 (6)
Graduated level	2 (3)

Note: Figure in the parentheses represents percentage.

Table 4.14 Common types of crop grown by sample farmers (N = 77)

Crop	No. of farmers
Paddy	55 (71)
Chickpea	33 (43)
Groundnut	32 (42)
Green gram	19 (25)
Sesame	30 (39)
Pigeon pea	29 (38)
Wheat	13 (17)
Cotton	13 (17)
Corn	5 (6)

Note: 1.Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

Table 4.15 Participation of sample farmers in various organizations (N = 77)

Participation status	No. of farmers
Member	45 (58)
Non member	32 (42)
Types of organization	
Farmer group	3 (7)
Village administrative group	9 (20)
Social and religious group	26 (57)
Water user group	4 (9)
Cooperative	8 (17)

Note: 1. Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

4.8 Linkage of Farmers with DOA in Study Area

4.8.1 Contact areas of sample farmers with DOA

In Table 4.16, it can be observed that 23% of sample farmers had coordination activities with DOA and they were contact farmers while other 77% had no coordination with DOA and they were non-contact farmers. Among the contact farmers, the coordination activities were good agricultural practices (GAP) in rice production (50%), seed production activities (33%) and varietal trial (28%) with DOA on their farms. According to the coordination activities, the sample farmers received crop production technology (78%), support in field activities (50%), input such as good quality seed (28%) and field observation of DOA staff (28%).

4.8.2 Reasons of sample farmers for no coordination with DOA

Among non-contact farmers, the reason for no coordination with DOA was no offer from DOA (10%). No time to coordinate with DOA because they were busy with their farm works (31%). Twenty five percent answered that they had no interest and willing to coordinate with DOA. At the same time, 22% had budget constraints in their crop production to coordinate with DOA, so they had no coordination with DOA. Other 5% of sample farmers said that the reason for no coordination with DOA was their farms were not located on besides or near main road (Table 4.17). The DOA staff usually selected the farmlands which were closed to the main road for convenient observation.

4.8.3 Contact frequency per year of sample farmers with DOA and private company

Table 4.18 shows that contact frequency per year of sample farmers with DOA and private company in survey area. All sample farmers had contact frequency of 7 times per year with DOA in average with maximum 48 times per year. Sample contact farmers had contact 22 times per year in average with DOA ranging from 5 to 48 times per year. On the other hand, sample non-contact farmers had average contact frequency of 2 times per year in maximum 6. Average contact frequency of all sample farmers with private sector was 2 times per year with minimum 0 and maximum 7 times per year.

Table 4.16 Coordination activities of sample farmers with DOA (N = 77)

Item	No. of farmers
Contact	18 (23)
Non-contact	59 (77)
Coordination areas/programs	
GAP in rice production	9 (50)
Seed production	6 (33)
Varietal trial	5 (28)
Supporting coordination activities	
Technology provision	14 (78)
Support in field activities	9 (50)
Input such as good quality seed	5 (28)
Field observation by staff	5 (28)

Note: 1.Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

Table 4.17 Reasons for having no coordination activities with DOA (N = 59)

Reason	No. of farmers
No response	4 (7)
No offer by DOA	6 (10)
No time to coordinate with DOA	18 (31)
No interest in coordination programs	15 (25)
Budget constraints	13 (22)
Farmlands were not besides main road (out of planned area)	3 (5)

Note: Figure in the parentheses represents percentage.

Table 4.18 Contact frequency per year of the sample farmers with DOA and private company

Types of farmers	Frequency per year		
	Av.	Max.	Min.
DOA with all sample farmers (N = 77)	7	48	0
DOA with sample contact farmers (N = 18)	22	48	5
DOA with sample non-contact farmers (N = 59)	2	6	0
Private company with all sample farmers (N = 77)	2	7	0

4.9 Perceptions of the Sample Farmers on Role of Extension Staff and Extension Services of the DOA

4.9.1 Perceptions of sample farmers on role of extension staff

In this study, the perceptions of the sample farmers on role of extension staff of the DOA were examined. About 91% of sample farmers recognized the role of extension staffs for their villages' development. The reasons for their recognition were they largely received agricultural knowledge (59%), update technology (56%) and help and suggestions from extension staff (41%), extension staff are important for their village development (29%) and they received good quality seed (6%) (Table 4.19).

Table 4.19 shows that only 9% of sample farmers answered that they didn't recognize the role of extension staff. Among them, the sample farmers commented that technologies given by extension staff were not relevant to their real condition (43%), it was a waste of time to work with the extension staff (43%) and it was a few contact of staff with farmers respectively (43%). Other opinion was they did not get feedback for their questions from extension staff (14%). The percentage of pessimist was lower than that of sample famers who recognized the role of extension staff. According to the results, services of extension staff and more contact with farmers were necessary for the sample villages.

4.9.2 Perceptions of sample farmers on extension services from DOA

Figure 4.12 explains quality attributes of extension services by extension staff of DOA. There were many perceptions of sample farmers upon the extension services of DOA. Forty six percent of sample farmers answered extension services received from DOA was partial adequate for their farming and 14% said that extension services and information were not inadequate for them. But, 40% of them commented that extension services were adequate.

In terms of quality of extension services from DOA, 38% of respondents impressed on quality of extension services but 54% replied that quality of extension services were average for them. At the same time, a few of them about 8% also answered that it was low quality for their farming. In terms of relevance for crop production, 59% of respondents thought that extension services of DOA were relevant for them in average. Only 36% of them said that extension services were highly relevant for their farm. On the other hand, 5% of them perceived that extension services were irrelevant for them.

Table 4.19 Sample farmers' perceptions on role of extension staff of DOA (N = 77)

Perceptions	No. of farmers
Importance of extension staff in villages	70 (91)
Reasons	
Receive knowledge	37 (59)
Receive technology	35 (56)
Receive help and suggestion	26 (41)
Important for village development	18 (29)
Receive good quality seed	5 (6)
No importance of extension staff	7 (9)
Reasons	
Not suitable with their real condition	3 (43)
A few contact with farmers	3 (43)
Time consuming for coordination	3 (43)
Lack of feedback from staff	1 (14)

Note: 1. Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

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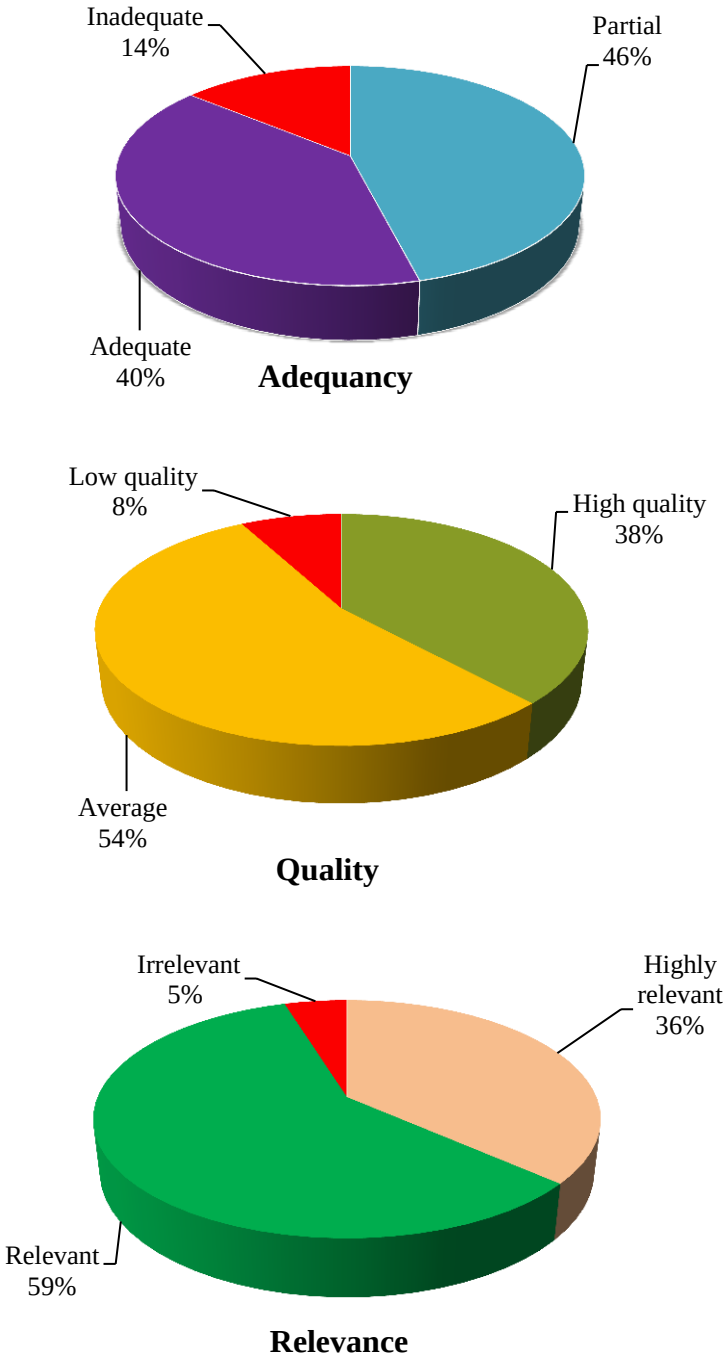

Figure 4.12 Perceptions of sample farmers on quality attributes of extension services given by extension staff of DOA

4.10 Strength and Weakness of Extension Services of DOA

Table 4.20 illustrates the sample farmers' perceptions on strength and weakness of extension services from DOA. Strength of extension services received by sample farmers from DOA was technology (48%), knowledge (29%), increase in production (13%), and decrease in production cost, profit (6%) and quality seed (5%).

Although extension services of DOA had much strength, there were also many weaknesses. About 38% of sample farmers responded that some technologies transfer by DOA were difficult to follow in their farm production and 30% of them said that some information were not suitable to their real condition. And, some farmers said that they didn't get good quality seed adequately (16%). About 10% of sample farmers perceived it was a waste of time for meeting and they received no clear information from the extension services. A few percent answered that there was a few contact extension (8%), lack of suitable market premium for some varieties recommend by DOA (5%) and there was no reply and response from extension staff concerning with questions on pests and diseases (3%) respectively.

Table 4.20 Sample farmers' perceptions on strength and weakness of extension services (N = 77)

Strength	**No. of farmers**
Receive technology	37 (48)
Improve knowledge	22 (29)
Increase yield	10 (13)
Reduce cost	10 (13)
Get profit	5 (6)
Receive quality seed	4 (5)
Weakness	
Some technologies are difficult to follow	29 (38)
Some information are not suitable to their local conditions	23 (30)
Quality seed distribution wasn't meet the requirement	12 (16)
No clear information from DOA	8 (10)
Time consuming for meeting	8 (10)
Few extension contacts	6 (8)
Have no market premium for crops	4 (5)
No feedback information on pests and diseases problems	2 (3)

Note: 1. Total percent may not equal to 100 because respondents can answer more than one item.
2. Figure in the parentheses represents percentage.

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4.11 Focus Group Discussions with Farmers Regarding Extension Services by DOA in Study Area

The seven focus group discussions with farmers (5-6 participants) in the study area were conducted to examine the effectiveness of extension services provided by DOA. Perceptions of farmers on extension services that they received were also investigated for complementary findings to reinforce the results of survey research to get a better understanding of the extension services.

During focus group discussions with farmers, it was reported that most of them met with extension staff in village head's house for group meeting once per year. In lowland area, although extension staff visited to field, they mainly met and work with rich farmers. They received was technology of good quality seed in crop production extension services. However they did not get good quality seed adequately from DOA. They bought seed from neighbor farmers and agrochemical shops. Although farmers received some technologies given by DOA such as GAP in rice production and seed sowing techniques in upland crops, they were not useful in their real condition such as labor constraints, inadequate inputs, and water scarcity.

Moreover, it was reported that farmers didn't get response or reply from extension staff about soil and pests and disease problems and they received information on agrochemical from private companies and farmer to farmer linkages. Moreover farmers needed help from DOA in receiving machines such as combine harvester and transplanting machines and they want to get help from DOA for adequate water supply in crop production. Detailed discussions of farmers in focus group discussion were expressed in the following.

Notes of Farmers' Discussion in Focus Group Discussion

We met with DOA at village head's home and they came only once per year. We got seed sowing techniques from DOA on sesame and groundnut but it was not suitable to our farm conditions. We received advice from DOA to use good quality seed. However we did not get quality seed from DOA adequately. (No. of participants– 5, age range (26–54 years), land size range (1.2–6.8 ha), Nga Shan village)
We need good quality seed, good agricultural practices suitable with our areas from DOA. Because our area is rain fed area, our main crop is upland crop like legumes, sesam. (No. of participants– 5, age range (30–59 years), land size range (3.23–6.8 ha), Nwe Chway village)

Some of us practiced some technologies given by DOA in rice production but they were not convenient in practical due to problems such as high labor scarcity in transplanting and water scarcity. We got information on agrochemicals mainly from private companies and we didn't get reply from DOA on soil problems and pests and diseases. We needed help from DOA to get combine harvesters. (No. of participants – 5, age range (33–56 years), land size range (2.8–6.47 ha), Thone Pan Hla village)

We met with DOA at village's head once per year during crop season and others met with DOA individually only when our farm had problems such as pets and diseases. We received technologies from DOA in rice production and green gram but did not practice because of high production cost. (No. of participants– 5, age range (20–44 years), land size range (2.02–8.09 ha), Aung Chan Thar village)

DOA staff should visit farmers' fields. They should visit at least 4 times during the crop season. They mainly contact with farmers who owned large farm. Moreover, transplanting machines should be provided to reduce labor cost. (No. of participants – 6, age range (41–63 years), land size range (1.61–5.6 ha), Taw Kyaung Kyi village)

DOA should help farmers to find out the opinions for solving the problems farmers are facing (pest and disease problems, soil problem). DOA should give technologies which are suitable to our farm conditions. In current condition, technologies given by DOA were not used on farm because of high labor cost. (No. of participants– 6, age range (35–61 years), land size range (1.82–2.83 ha), Kin Moon Taw village)

We solved pests and disease problems with control measures given by neighbor farmers and agrochemical shops. We faced seed impurity problems but we did not receive adequate amount of seed from DOA. We didn't get water from canals adequately. (No. of participants– 5, age range (33–63 years), land size range (0.4–2.02 ha), Pae Pyit Taw village)

4.12 Factors Influencing on Contact Frequency of Sample Farmers with DOA Extension Staff

Contact frequency of sample farmers with DOA extension staff was included as the dependent variable in the regression model. The independent variables of the model were household head's age (year), household head's education level, and household size, number of family labor, farm size and five dummy variables of paddy farmers, participation of farmers in various organizations, contact of sample farmers with private sector, village distance from the town and coordination activities of DOA.

According to the descriptive statistics, average contact frequency of sample farmers with extension staff of DOA was 7 times per year, average household head's age (48.77) years, average household size (4.44)persons, average no. of family labor (3.35), average farm size (3.00) ha. Among sample farmers, 71.43% grew paddy, 58.44% participated in various organizations, 37.66% had contact with private sector, 57.14% lived in village where distance from the town was less than 5 miles and 22.62% had coordination activities with DOA (Table 4.21).

The empirical analysis of the determinants or influencing factors on contact frequency of sample farmers with DOA extension staff were carried out by using multiple regression analysis. In the analysis, not only some quantitative variables but also some qualitative or dichotomous variables were considered and the results were given in Table 4.22. Contact frequency per year of sample farmers with DOA extension staff was dependent variable and independent variables were household head's age, household head's education, household size, family labor and farm size. Moreover, dummy variables such as paddy farmers, participation in various organization, contact with private sector, village' distance from town which is less than 5 miles and coordination activities with DOA were considered as independent variables.

The results of regression analysis indicated that contact frequency of sample farmers with DOA extension staff was positively influenced by household head's education, farm size and paddy farmers but not significant. Farmers who had higher educational level had high contact frequency. Moreover, farmers who grew paddy and possessed large farm size received more extension services.

Contact frequency of sample farmers with DOA extension staff was positively and significantly influenced by number of family labor, coordination activities of DOA at 1% level. Farm household with higher number of family farm labor had more contact with extension staff of DOA. Farmers who involved in extension activities carried by DOA

had high contact frequency with staff of this institution. Moreover, contact frequency was positively and significantly related to participation in various organizations at 5% level. If farmers' participation in various organizations increased by 1%, contact frequency will be increased by 5.20%. It was assumed that members in various organizations had more willingness to meet extension staff.

On the other hand, contact frequency was negatively associated with contact with private sector and household size but not significant. Farmers who had contact with private sector and larger family members would have less contact frequency. Household heads' age was negatively and significantly influencing factor on contact frequency at 5% level. Ageing farmers had low contact with extension staff DOA. The fact that they were traditional and didn't want to take risks and accept new technologies. Among the variables, contact frequency was negatively and significantly influenced by distance from the town. Farm households who lived in less distance from town would not have high contact frequency. In other words, farm households in far distance from the town had high contact. In this study, the reason would be far villages from the town had good road condition for travelling and conducting river pumped irrigation project area. The adjusted R^2 points out that the model was significant and it can explain the variation in contact frequency of sample farmers with DOA extension staff by 50%.

Table 4.21 Descriptive statistics of dependent and independent variables in contact frequency function of sample farmers with DOA extension staff (N = 77)

Variables	Units	%	Avg.	Range	SD
Contact frequency	Times/ year	-	7.34	0-48.00	11.32
Household head's age	Year	-	48.77	20.00-65.00	10.04
Household head's education		-			
Household size	No./hh	-	4.44	2.00-7.00	1.39
Family labor	No./hh	-	3.35	1.00-6.00	1.33
Farm size	ha	-	3.00	1.00-11.00	2.44
Paddy farmers					
1= If farmers grew paddy	Dummy	71.43			
0= Otherwise		28.57			
Participation of farmers in various organizations					
1= Participate	Dummy	58.44			
0= Otherwise		41.56			
Contact of sample farmers with private sector					
1= Yes	Dummy	37.66			
0= No		62.34			
Village distance from the town					
1= < 5 miles	Dummy	57.14			
0= ≥ 5 miles		42.86			
Coordination activities of DOA					
1= Yes	Dummy	22.62			
0= Otherwise		77.38			

Note: Education level of household head is referred from Table (4.13).

hh = household

Table 4.22 Regression results on contact frequency of sample farmers with DOA extension staff (N = 77)

Independent variables	Unstandardized. Coefficient (B)	Standardized Coefficient (β)	T-value	Sig.
(Constant)	2.620		.389	.699
Household head's age	-.257**	-.227	-2.251	.028
Household head's education	1.738^{ns}	.109	1.206	.232
Household size	-.516^{ns}	-.063	-.607	.546
Family labor	2.643***	.310	2.875	.005
Farm size	.208^{ns}	.110	1.238	.220
Paddy farmers	1.569^{ns}	.063	.650	.518
Participation in various organizations	5.202**	.225	2.495	.015
Contact with private sector	-1.457^{ns}	-.062	-.718	.475
Village distance from town	-5.214**	-.228	-2.645	.010
Coordination activities of DOA	15.307***	.583	6.513	.000

Note: Adjusted R^2 = .503, R^2 = .568 ***, ** and * are significant at 1%, 5% and 10% level respectively and ns = not significant

CHAPTER V
SUMMARY OF MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The chapter consists of three main sections. The summary of findings of the research is the first section. Second one is the conclusion of the study and the last outlines the recommendations of the research to improve the institutional management and system of township level DOA, linkage with their clients, rural farmers and partner institutions.

5.1 Summary of Main Findings

The summary of main findings based on the results and discussion in Chapter IV is shown in Appendix 3. Detailed explanations of main findings are expressed as the following subtitles.

5.1.1 Demographic characteristics, training experiences and ways of updating technological knowledge of extension staff

By analyzing demographic characteristics of all extension staff**,** it was found that the average age of all extension staff was around 35 years within the range 21-79 years. At township level DOA, number of female extension staff was higher than that of male staff. It was examined that 84% of extension staff got diploma from State Agricultural Institute and about 13% of staff were graduated from Yezin Agricultural University. Regarding family background information, 77% of staff's parents were farmers. Average number of training attendance for all extension staff was 2 and less than 10% of staff had in service, seed and plant protection training experiences. Most extension staff updated their new technological knowledge with training experiences, media such as radio and TV and internet sources. About 74% of extension staff didn't have awareness on participatory extension approach. Most of the staff's aspiration on job was to get high position in DOA. More than half of extension staff didn't have motivation to raise their academic background.

5.1.2 Working conditions of DOA township level and linkage with partner institutions

Working conditions of DOA township level and linkage with partner institutions: working conditions of DOA with their clients, farmers in study area were examined. Each field extension staff was assigned with 5 villages in average but they had only 10 numbers of contact farmers in their assigned area. About 52% of staff had regular field visit and only 61% of staff were able to contact with about half of their clients in assigned

area. All staff used extension methods such as group meeting at village tract, farm and home visit. Demonstration method was secondly mostly used by field extension staff. Main reasons of extension staff for contacting with farmers were to conduct and observe demonstration farms, to record and collect data and to provide seed. About 52% of staff had contact with DAR but less than 50% of staff had contact with NGO/INGO and private sector. And average contact frequency per year of staff with DAR as well as private sector was 2 times per year and with NGO/INGO was 1 time per year. Most extension staff perceived that more coordination and exchange of experiences were required between DOA and DAR at township level. According to results of key informant interview, township staff officer from DAR said that more and close observation on farm trails by staff from these two institutions was needed. Furthermore, improvement of linkage between researchers, extension staff and farmers to meet actual need of farmers was essential. Staff officer from DOA viewed that there were some contact activities with NGO/INGO at township level but needed more coordination and these organizations should give adequate supporting to farmers in carrying out project activities. Unit manager from NGO responded that their institution had a few contact with DOA Both staff officer and respondents from agrochemical companies thought that there was no formal contact among staff because of different objectives and staff from agrochemicals retail shops had contact with DOA for quality checking and to attend CPA trainings. It was found that DOA had a few contact with output buyer but not with processor in the study area.

5.1.3 Perceptions of respondents from DOA and partner institutions on township level DOA

Perceptions of respondents from DOA and partner institutions on township level DOA: extension staff had different perceptions on their working environment. About 59% of staff didn't thought that they had top down supervision with their supervisors but 41% thought that they had top down linkage with supervisors. And most said that they received assigned duties equally and discussed about extension work among them. On the other hand, about 50% of them assumed that township level staff didn't received opportunity among same level in same institution and work performance-based promotion. Main problems faced by extension staff in their extension work were lack of proper market and price, no incentive for staff, budget constraints, poor mobility, and inadequate number of staff and little trust of farmers on DOA. Comments given by most

extension staff for improving extension were to upgrade the quality of staff and to provide useful technologies, input such quality seed and credit for farmers.

Staff officer viewed on township level DOA such as extension services received less interest by farmers and farmers thought that some services were not applicable in their field conditions. It is needed to have more carrying out extension services and activities and supporting inputs to farmers to get the trust and interest from farmers. Regarding with extension staff, they needed more experiences to improve their knowledge and provision. Research officer said that more contact with farmers, careful supervision on farm trial and to know farmers' conditions more precisely were required at DOA. Like research officer, unit manager responded that DOA should have more contact with farmer, more, more number of extension staff and support to credit for farmers. Respondents from private sector perceived that DOA should persuade farmers for involving farmers in group meeting and carry out meeting carefully. Sufficiently provision of good quality seed, credit and extension services on post-harvest technologies and agrochemicals are needed. Some staff needed experiences in dealing with farmers. Suitable market and price for farmers are also essential.

5.1.4 Demographic characteristics and perceptions of sample farmers on extension services of DOA

Demographic characteristics and perceptions of sample farmers on extension services of DOA: average age of sample farmers was 49 year old and there was an average of 4 family members in the household and 3 people were working in their farm on average. They had average total farm size in 3 hectare. Common crops grown by sample farmers were paddy, chickpea, groundnut, pigeon pea. It was found that most of sample farmers had primary education level followed by secondary education. Survey' results indicated that 23% of sample farmers had contact activities with DOA such as GAP, seed production and varietal trail. On the other hand, 77% had no contact with DOA due to the facts that they had sufficient time to contact, they had no interest and they didn't have adequate money to collaborate. Average contact frequency per year of all sample farmers with DOA was 7 times. It was 22 times for contact farmers and 2 times for non-contact farmers. Most recognized the importance role of extension staff and main perceptions were improving technology, knowledge and provision but some didn't recognize for the facts such as incompatible extension information with existing field conditions, a few contact of extension and lack of feedback from extension. Half of

farmers perceived extension services partially covered farmers' needs, quite qualified and relevant with local condition. Sample farmers viewed on DOA such as they received technology, improved knowledge, increased yield and reduced cost in their crop production from DOA but some technologies were not local-specific, they didn't get quality seed adequately and time consuming for meeting.

5.1.5 Determinant factors influencing on contact frequency of sample farmers with extension staff of DOA

Determining the main factors influenced on contact frequency of sample farmers with DOA extension staff was analyzed by the regression model. At 1% level, family labor and coordination activities of DOA were positively significantly related to contact frequency. Participation in various organizations showed positive relationship with contact frequency at 5% level. Although household head's education, farm size and paddy farmers were positively related with contact frequency, they were not significant. Contact frequency had negatively and significantly relationship with household heads' age and village' distance from the town at 5% level. And also household size and contact with private sector were negatively influenced on contact frequency and not significant.

5.2 Conclusions

Female extension staff's percent was higher than male percent according to gender issue. In terms of marital status, most were single. In educational level of extension staff, most of extension staff were diploma holders and only a few percent had B.Agr.Sc degree. However, most staff had no motivation for further study to raise their education level. As extension knowledge, most of staff lacked of knowledge such as Participatory Extension Approach (PEA). Staff were updated technological knowledge with different types of trainings, but training experiences were received regardless of position. Training experiences of all staff as well as content of trainings on plant protection and seed technology were very few.

In working condition of extension staff in study area, individual staff had too many farmers to contact for technological transfer and about half of extension staff had regular trip to their assigned areas. Therefore, they were able to contact about half of client farmers. Their main reasons to contact farmers were to conduct and observe demonstration farms and to record and collect necessary data. All extension staff used extension methods such as group meeting at village tract, farm and home visit and demonstration method. But farmer field school, field day and media were used by a few percent of staff.

Based on the results of semi structured interview and key informant interview with respondents from DOA, DAR, NGO and private sector, it was found that current linkage between DOA and DAR needed to be strong. It is needed to have more contact, and more cooperation such as more observations on farm trails and share of knowledge and experiences to meet the actual need of farmers. Linkage with NGO/INGO was also weak and more contact and collaboration with NGO/INGO were needed for more supporting to farmers from NGO/INGO in conducting joint project such as not only seed but also some part of production cost because of labor requirement in data collection. Regarding with private company, formal linkage of DOA with private company was not found except with retail agrochemical shops and a few percent of DOA staff had only personal contact with staff from private sector.

Most DOA staff perceived their assigned duties and workloads were equally distributed, and they had work discussion among staff. However, some staff disagreed on the fact that current promotion system was merit based promotion system and fair opportunity for all entitled staff. Perceptions of respondents from different agricultural related institutions on DOA could be categorized into two issues. Firstly, in concerning

with extension staff, there was no incentive and lack of mobility for staff. Adequate provisions to extension staff were required and it was also needed to raise number of qualified staff in terms of academic background, technological knowledge and communication skill.

Secondly, in concerning with extension work, opinions and suggestions were to create suitable market and price for crops production. It was needed provide inputs and technologies which meet farmers' actual need and, to share knowledge not only on yield but also plant protection and post-harvest. Provisions of inputs and local specific technologies to farmers were also necessary. Extension activities with farmers were also required. Lastly but not least, efficient and sufficient budget allocation was essential factor in functioning extension activities and services.

In the case of farmers' perceptions on extension services, only a few percent of sample farmers had coordination activities with DOA staff such as GAP, seed production and varietal trial. Main reasons of non-coordinated farmers were they didn't have adequate time, they had lack of interest, and budget constraints in participation of extension programs. Most farmers recognized the role of extension staff in the village with main reasons of knowledge and technology improvement but only a few sample farmers recognized for receiving good quality seed. Some didn't recognize the role of DOA. The reasons were such as some information given by DOA was not suitable in real condition, a few contact and lack of feedback from DOA. In terms of delivery of sound and effective extension services, there were still some challenges and extension services were ranked as partial adequate, average quality and relevant in local condition. They perceived that some received technologies are not useful in specific field condition, moreover, they didn't get quality seed adequately; time consuming for meeting regardless of applicability.

Considering the influencing factors on contact frequency, family labor, coordination activities with DOA and participation in various organizations were directly correlated with contact frequency. Regarding family labor, farm households who had the larger the number of family members involved in farm would have more contact with extension staff since they had more interest in agricultural technologies for increasing their farm productions. Farmers who already conducted extension activities with DOA had more contact frequency than others. In other words, contact farmers met with extension staff of DOA than non-contact farmers. Moreover, farmers who were members of various organizations would have more willingness to contact with DOA. Household

heads' age was negatively significantly affected on contact frequency. The older farmers were conservative and using traditional techniques on their farms and they were not likely easy to accept modern technologies and less contact with DOA. Farmers who stayed near from the town less than 5 miles had less contact frequency. The reason would be far villages from the town had good road condition for travelling and in other words, contact frequency was positively associated with road condition for travelling and communication between town and villages.

5.3 Recommendations

Based on the findings, it would be recommended that capacity buildings programs for extension staff are required. So, adequate provisions of training opportunities for all level of extension staff to have better understanding and experiences in new technologies such as plant protection, seed technologies and extension methodologies are essential. Planning of extension activities would be taking into account limitation of human resources in DOA. It would be efficient and effective technological transfer methodologies to farmers which would be suitable for extension staff either. Extension methods such as farmer field school, field day that all level of farmers can participate and improve and share their knowledge and mass media for rapidly received technologies among farmers should be more practiced in present extension services. Promotion system based on defined criteria such as academic background and work performance should be practiced. Therefore, promotion system would be systematic, fair and transparent to all levels of staff in DOA. As extension staff have to travel to farmers, travel allowance, mobile facilities, vehicles and residential supports would be essential for create motivation of DOA staff.

Success in disseminating improved technologies by extension organizations requires functional linkages with all stakeholders including farmers, research institutions, training centers and the private sector. To enhance the efficiency of extension services, building up of effective coordination and contact between public-private extensions is also needed. Although DOA and DAR had coordination and contact activities, their activities should be more developed for conducting and ensuring research findings of new technologies which meet actual needs of farmers and to provide local specific technologies and inputs such as good quality seed. The connection and flow of information between extension and research should be increased to transfer effective research knowledge to farmers. Extension programs should be planned and implemented with proper consideration of farmers' socio economic conditions, knowledge and other

limitations. Extension services on regional and local specific technologies and a wider diversity of crops and farming systems which more closely reflect agro-ecological zones should support to farmers. Technologies diffusion and extension activities should be carried out with consideration on all marketable crops. It is essential to create an accessible market and price of main crops grown by farmers. This study indicates that the need of further studies on current extension services and strategies at not only grass root level but also high level of institutions.

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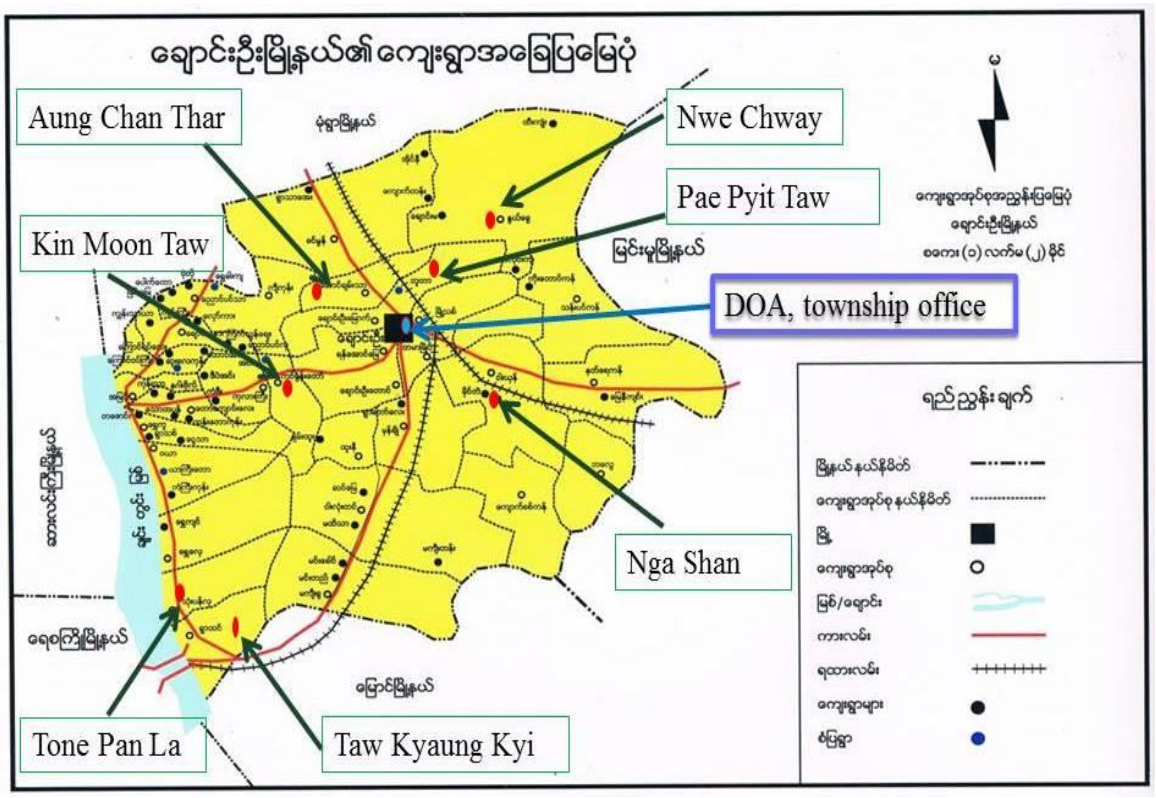
APPENDICE

Appendix 1 Map of township and location of sample villages



Appendix 2 Participation of sample farmers who participated in agricultural extension activities

Items	No.	%
Participated sample farm households who have chance	25	32
Non- participated farmers	52	68
Title of activities		
Field visit	11	44
Training	9	36
Farmer field school	5	20
Contents of activities		
GAP	4	16
Pests and diseases	6	24
Green manure	5	20
Crop production	10	40
Mechanization	3	12
Organizations		
DOA	18	72
Private sector	4	16
Other	4	16

Note: Total percent may not equal to 100 because respondents can answer more than one item.

Appendix 3 Summary of main findings