



Overview of Agricultural Research and Extension Policy to Implement a Strategy of Agricultural Diversification

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INTRODUCTION

The vision of agricultural sector for the country's development is "An inclusive, competitive, food and nutrition secure and sustainable agricultural system contributing to the socioeconomic wellbeing of farmers and rural people and further development of the national economy." The recently launched Agricultural Development Strategy stated that the contribution of agricultural development can be achieved through agricultural diversification where agricultural extension system delivers improved products and technologies for adoption and adaptation; improved research-extension coordination systems with participation of farmers and the private sector; improved education and training system to build "human capital" in the agricultural and food sector responding to the evolving needs of farmers and the private sector in rural areas.

In the past two decades, although Myanmar's agricultural sector has undergone significant structural transformation, it is still largely dominated by low-value rice production. Long time implementation of rice-centric agricultural policy may leave some obstacles for the implementation for diversification in the new era. Agricultural research, extension and education system play vital roles in the agricultural sector development and this brief is to assess the recent research, extension and education system in the agriculture sector and to give recommendation on the way forward to intensive diversification from production to consumption of agricultural commodities.

AGRICULTURAL RESEARCH SYSTEM

With the vision of food security and nutritious food production for Myanmar people, the Department of Agricultural Research (DAR) is the principal government agency involved in agricultural research and development. The mission of DAR is to systematically conduct research activities that would suit the needs of all stakeholders, and disseminate various improved crop varieties and technologies that are locally adapted in different agro-ecological regions of Myanmar.

Aligned with country's agricultural policy, research programs of DAR has been giving attention on increasing crop production through improved seeds, and a few program on crop management, crop protection techniques, and cropping systems tailored to suit the country's various agro-ecological zones. Central DAR is composed of seven divisions as follows:

1. Rice and other cereal crops division;
2. Oil seed crops and food legumes division;
3. Industrial crops and horticulture division;
4. Soil, Water Utilization and Agricultural Engineering division;
5. Agronomy, Agricultural Economic and Statistics;
6. Biotechnology, Plant Genetic Resources; and
7. Administration and Financial Division

Local agricultural research centers and satellite research farms were also established in different ecological zones of the country. Each regional research station has its mandated crop to conduct research and improvement of varieties. Although the vision also emphasizes nutritious food production, the mandated crops that are dominating the farms are mostly staple crops such as pulses and oil-seed crops and very few for vegetables. Research for tuber or root crops and fruits are still missing.

In terms of human resource, the total number of research staff to run research work for the whole country is 734, not only for the central research center in Yezin but also in the research stations. Central DAR in Yezin itself has 335 staff, where 76% of them are female researchers and 24% are males. In addition there are more females with higher degree than males. In addition, 71% of the human capital resource is allocated in plant breeding and genetic specialization and there is no food technology and nutrition science specialist within the whole department (Table 1).

Table 1. Distribution of graduate in different research activities

By Specialization	PhD	MSc	BSc	Total	%
Plant breeding/genetic	15	40	184	289	71.4
Plant Pathology	2	6	10	18	4.4
Plant Physiology	1	10	20	31	7.7
Bio-diversification	-	1	-	1	0.2
Socioeconomic/ Agricultural economics	-	5	5	10	2.5
Entomology	2	5	10	17	4.2
Agro Biodiversity	1	-	-	1	0.2
Agronomy	2	10	10	22	5.4
Soil and water	2	3	10	15	3.7
Molecular breeding+ other	1	-	-	1	0.2

Source: DAR, 2018

In accordance with their specialization and department priority crop, the research work is also mainly on the process of producing improved or hybrid varieties. The route research plans presented in the annual report of DAR regional farms are mostly about the experiments on the improved and hybrid variety of their mandated crops. Within five years, the publication of research for academic purposes showed also the dominance of rice research publication papers on other crops (Table 2).

Table 2. Publication articles for research and academic purposes

Year	No. of research papers												
	rice	hybrid rice	other cereal	oilseed crop	pulses	vegetable / fruits	Industrial crop	soil	water	biotech	Seed bank	plant disease	pest
2011-12	13	2	6	6	3	2	2	1	3	5	7	6	
2012-13	16	1			4	2	1	2	2	5	6	6	
2013-14	15	1	5		4	1	1	1	6	6	3		1
2014-15	11		3		2	1			2				
2015-16	16			3	0	1	1		2			1	
	71	4	14	9	13	7	5	4	15	16	16	13	1
	38%	2%	7%	5%	7%	4%	3%	2%	8%	9%	9%	7%	1%

Source: Author's summary on papers of Myanmar Agricultural research journal

Being the staple food and policy priority crop, the research activities mostly focus on rice but also on varietal improvement. Assessment on more than 20 years of activities of production of improved variety showed that DAR produced different kinds of improved rice varieties at 48% of total variety produced followed by pulses at 17% and other cereal crops at 14% (Table 3).

Table 3. Type of improved varieties produced by DAR until 2018

Types of Rice	Number of varieties	%	All rice varieties %
Irrigated rice	36	16.67	48.13
Rained lowland rice	36	16.67	
Upland rice	4	1.85	
Submerged tolerant rice	1	0.46	
Aerobic rice	1	0.46	
Deep water rice	8	3.70	
Drought tolerant rice	8	3.70	
Salt tolerant rice	5	2.31	
Quality rice	5	2.31	
Maize and other cereals	32	14.81	
Oilseed crop	19	8.80	

Food legumes	37	17.13	
Industrial crops	20	9.26	
Horticultural crops	4	1.85	

Source: DAR (2018)

There are not many improved variety of vegetables or root crops or other vitamin-rich vegetables. The uptake of improved technologies, therefore, has been limited. Moreover, the research activities exclude the important issues such as cost of production, profitability, land management, farm management, crop overall farm income, and suitability to agro-ecological zones.

AGRICULTURAL EXTENSION SYSTEM

Crop sector extension

Conventional Agricultural Extension System was practiced in 1927, Training and Visit System in 1974, Special High Yielding Program in 1975 and terminated in 1988 with the political changes, summer rice production in 1992-93, Special Crop Production Zone in 1999, Block-wise Crop Production Program in 2000, Integrated Rural Development Programs in cooperation with relevant ministries/departments. Some of development projects support extension programs, Farmer's field school model by UNDP Project in the dry zone.

With the political changes in the country, agriculture policy changes drive extension movement to change to mechanized farming, trade liberalization of agricultural products, market oriented production development such as Good Agricultural Practice (GAP), Systematic Rice Intensification (SRI), Integrated Pest Management (IPM), certified seeds distribution, disaster risk reduction and so on.

Current extension approaches that are practiced in the whole country are to establish integrated high technology demonstration villages by practicing GAP, and to conduct site specific soil nutrient management and seed production, conducting demonstration programs for GAP, SRI, organizing Seed Grower Associations/ Cooperatives, Commodity Development and Production System for Mango, sesame, green gram, mung bean, tomato, coffee, and dragon fruit.

In addition, extension service includes dissemination of information about rules, laws and regulation and updated technology through Social and Mass Media such as DOA homepage and Facebook, Radio, TV channel (Farmer Channel), newspaper, posters, pamphlets, bulletins, agricultural shows.

The last updated structure of DOA is composed of:

1. Extension division;
2. Rice division;
3. Seed division;
4. Land use division;
5. Plant protection division;
6. Horticulture and biotech division;
7. In-service training and SAI division;
8. Sugar crop division;
9. Cotton and allied fiber crops division perennial crops division; and
10. Coffee-seasonal crops division

Although extension division is separately organized, each of other division conducts extension work and services for their mandate crops. Besides these main divisions, DOA also had the supporting divisions of

1. Project planning, management and monitoring division
2. Policy and admin division
3. Finance division
4. Procurement division

Moreover, to support extension and research function to DOA, there are research and training center such as - Central Agricultural Research and Training Centre (CARTC), Vegetables and fruits Research and Development Center (VFRDC), Central Settlement and Land Record Development Centre, Irrigation Training Centre (ITC), Applied Research Centre of Perennial Crops (ARCPC), Farm Machinery Training Centre (FMTC), Myanmar Cannan Farmer's Training Centre (MCFTC), Myanmar OISCA Farmers Training School, and Agricultural Extension and Rural Development Training Center (AERDTC).

CARTC provides trainings for seedlings, seed bed making, field inspection method to freshman/ woman and managerial officials of DOA. In addition, the center provides trainings on production technology of vegetables and fruits. VFRDC's main activities are production and distribution of hybrid and certified seeds of vegetables and fruits, and extension of these seeds to farmers.

Status of human resource in state and regional agricultural extension

In terms of human resource capacity, the Agricultural Extension Department is the largest branch composed of 8,161 extension staff who are agricultural technicians. There are about 4.4 million farm families in the country, and the ratio of extension staff to farm family is 1:534 (DOA, 2018).

According to the recent data, however, few percentage of post graduate level staff work in the extension sector. About 10% of higher graduate or specialists work in the extension service while most of them are assigned in the head offices for administrative work or for technical support to the decision makers (Table 4).

Table 4. Number of DOA staff with different qualifications

Organization	Ph.D	M.Sc	B. Agri Sc	Dip Agri	Other	Total
DOA Total Staff	67	205	2,761	5,652	2,360	11,045
Extension Staff	7	60	1,641	4,780	1,673	8,161

Source: DOA, 2018

Agricultural extension organizations under the DOA are composed of state/region agricultural offices, district/township agricultural offices. At each district or township office, deputy head officer is assigned as the leader of the production camp and two or more assistant managers and accountants are working under the leader. Assistant managers are responsible for extension services. Human resource capacity is very limited in the state and region agricultural extension sector. According to recent data, at least one extension officer has to supervise 230 farmer households on the average. In some case, one extension officer have to supervise 2,600 farmer households at maximum. In terms of crop area, one extension staff has to supervise 622 – 2630 ha of crop growing area regardless of crops diversification. According to the study of Khin Oo and Ando (2013), one extension staff has to supervise about 733 hectares of paddy, 290 hectares of cotton and 217 hectares of sugarcane in Magway township.

Insufficient extension staff with limited facility creates a lot of weakness in delivering appropriate technologies in different ecological conditions, and in dissemination of information and knowledge to farmers. Poor provision of transportation facilities and limited budget for extension service exacerbates the ineffectiveness of extension service.

Livestock sector extension

In the case of the livestock sector, Livestock Breeding and Veterinary Department (LBVD) is responsible to promote all-round development of the livestock sector providing animal health care and veterinary services. The department is composed of

1. Administrative division
2. Finance division planning, statistics, international and information technology
3. Division research and development
4. Division of veterinary medicine and disease control division public health
5. Division of human resources development
6. Division of animal resources development
7. Apiculture development division
8. Economic division

There are many prioritized activities that are undertaken by LBVD in the field of – Improvement of Livestock and Livestock Products, improvement of disease control, improvement of Animal Health, improvement of breed animals, improvement of livestock production system.

With the increasing trend of population and urbanization, the livestock sector production increased in terms of meat, milk and eggs.

The livestock sector extension is normally conducting training for departmental staff and laymen for veterinary and animal husbandry. Basic training on Animal Husbandry Practice is given to laymen. Refresher courses on livestock production, disease investigation and control, planning, financial management and administration are provided to veterinarians and other staff. Some technological training such as artificial insemination of cattle, artificial insemination of pig, training on feeding and herd management of dairy cattle, training on meat inspection, basis livestock production course, training on management of goat production.

On the other side, training for active farmers are also conducted such as community animal health workers, basic poultry production training, basic swine production training, ruminant nutrition training, pasture development training,

training on poultry production and biosecurity, training on vaccination, training on making silage, basic livestock production course, basic duck production, training on integrated farming.

One of extension education activities of LBVD is public awareness program such as publishing newsletters, advertisements in radio, TV and newspapers, distribution of pamphlets, exhibition.

The livestock services and department are mainly run by vets, and focus on animal health issues: curative treatment of individual animals, preventive health, and health screening of animal products. Extension services are run by the departmental level to the township and village levels. Besides central or regional governments, extension services can be run by NGOs, by cooperatives, by universities or research institutes and by the commercial sector.

Livestock production extension can also be the responsibility of institutions which, in principle or in practice, are dominated by animal health concerns and staffed mainly by vets (and paravets at the field level). Livestock production extension is provided through dedicated services or projects, and although there are few examples at a national levels, some area-based multi-lateral or bi-lateral projects. Animal health services success-fully delivering production information to mixed crop-livestock farmers, other than information linked specifically to material inputs such as drugs, vaccines or semen. Animal health services are success-fully delivering production information to mixed crop-livestock farmers, other than information linked specifically to material inputs such as drugs, vaccines or semen.

Disease prevention through vaccination campaigns, reduction of mortality and morbidity losses, and meat hygiene have remained priorities. Disease prevention through vaccination campaigns, reduction of mortality and morbidity losses, and meat hygiene have remained priorities.

As the improvement of livestock sector and products, LBVD could do the distribution of good productive performance breeds (dairy, beef and draught cattle, goat, pig and duck) to States and Regions, establishing the (27) livestock production zones, undertaking to increase the livestock population in line with expansion, undertaking to encourage the trade of livestock and livestock products, improvement of disease control area.

Moreover, for the dairy development, there was the importation of 100% Friesian cows and bulls, implementation of foreign assistant dairy development projects by cooperation with private dairy farmers. Distribution the good productive grass and legume seeds including Nivea grass and others to the livestock farmers for the development of pasture with the assistances from international project and/ or LBVD, and total cultivated pasture are 632.45 acres.

LBVD distributed frozen semen straws of beef, dairy and draught cattle, totally 16,808 straws free of charge to all States and Regions to raise the population and production of dairy and draught cattle. In addition, LBVD supplied the liquid nitrogen to all regions and divisions. As international aids, Department of Livestock Development, Thailand supported frozen semen straw of beef cattle (100,000) straws and frozen semen straw of dairy cattle (20,000) straws totally (120,000) straws as well as New Zealand government supported frozen semen straw of dairy cattle (5,000) straws.

Not only production activities of livestock products, LVBD also improves disease control of animals through the activities such as Upgrading Central Veterinary Diagnostic Laboratory in Yangon, upgrading and/or establishing Regional Veterinary Diagnostic Laboratories in States/ Regions and Districts, establishing the BSL2 Food and Mouth Laboratory in Shwe Myo, Nay Pyi Taw, supported by KOICA, establishing the Quarantine Stations and Check points. Issuance the Certificate on exportation and importation of animal and animal products, cooperation with international organizations and NGOs in the field of prevention and control of emergency infectious diseases and trans-boundary diseases are also conducted.

Quarantine stations are also settled in Yangon and Mandalay airport, Thilawa international Seaport, Kyaukphyu Deep Seaport and Myiet Seaport. Laboratory and check point are also established. As the extension for quarantine, the department has Thilawa Kyauk Tan, International Production of veterinary drugs & vaccines, providing the activities of treatment and prevention. Providing the Vaccination Programmes in States and Regions. Distribution FMD, HS, Anthrax, BQ, Hog cholera, Fowl cholera, ND vaccines, and ND, HS, Anthrax and BQ are vaccinated in free charges. Providing the Community Animal Health Workers (CAHWs) and Animal Health Extension Training for the development of animal health services.

LINKAGE OF AGRICULTURAL RESEARCH AND EXTENSION SYSTEM

Although DAR and DOA are the main actors for research and extension respectively, collaboration among them is still insufficient. Most of the activities are joint meetings 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 some international organizations, consultation meetings, to identify and/or to solve the problems faced in the implementation of various crop production programs. There is still a lack of collaboration and cooperation for the diversification issue. Moreover, there is no linkage among crops sector and livestock sector in extension and research services.

For many decades, extension services could not perform effectively and there are still enormous and diversifying challenges in different ecological zones of the country. To provide sufficient services in agricultural diversification, extension system should be diversified according to agrological types of agricultural area, needs of famers at different

socio-economic layers and to deliver proper agro technology and seeds. To accelerate agricultural diversification through extension system, it should integrate, co-ordinate, collaborate and communicate with all partners and actors such as NGO and private sector involved in the whole extension system.

Agricultural research program still focuses on policy priority crops such as rice and pulses. Most of research activities program are developed on the basis of individual crops or disciplines rather than a coordinated approach to problems farmers encounter in the country's diverse production systems. Although mandated crops are specified in different regional research farms, research activities still focus on rice in different agro- ecological zones. Over all development of research system in terms of financial and human resource, program improvement for diversification is needed.

Agricultural Development Strategy (2018) stated that a major reorientation of both research and extension to a farming systems approach is needed. Inclusiveness of private sector in research and extension delivery should also be included in modern agricultural economy. Agricultural research sector should create new research capacity and build research center linkages to ensure a farming systems approach to research planning.

Livestock sector does not incorporate with the crop sector while the production and research were undergoing their own way. There are still a lot of rooms for integrated research and extension activities among crops, livestock and fishery sector. It is also essential to develop a system where the major sectors – crops, livestock, fisheries and forestry – are all closely linked into a range of integrated systems. The relationships between these sectors vary considerably across the country, while the crop sector tends to be the major sector regarding food security and income, the others have an important role in sustaining the livelihoods of the rural poor, both in terms of on- and off-farm support.

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