
Chapter 5
PULSES INDUSTRY

1. INTRODUCTION

Pulses are grain legumes, which are harvested for dry grain only and are directly consumed by man. Pulses industry is one of the important industries such as rice industry in Myanmar economically, ecologically and socially. Pulses have been staple diets not only for human being but also for livestock since prehistoric time. As Myanmar is agro-based country, agriculture sector contributes 35% of total export earning, of which pulses take 72% of lion share in 2000-01. And pulses play important role in Integrated Plant Nutrient Management system because of its nitrogen fixing ability and crop residue left for the soil, which could increase soil organic matter. Moreover, crop such as pigeon pea can provide huge amount of fuel wood for rural people of central dry zone in Myanmar. It can relieve the pressure on forests of Myanmar where farmers are generally poor and rely on pulses as major source of protein in the diet even though fish and fish products are also other alternative sources of protein.

2. PULSES PRODUCTION

Myanmar is situated in Southeast Asia and has wide range of agro-climatic zones comprising delta area, coastal area, hilly area and central dry zone area. By virtue of varying agro-ecological areas, coupled with different precipitation patterns, crops such as cereals, pulses, oil seed crops and plantation crops are being grown in different parts of the country throughout the year. Among the food grains crops, next to rice, grain legumes form an important component of country's agriculture system. Pulses are conducive to multiple cropping under rain-fed and other marginal conditions because of the greater adaptability to abiotic stresses. Farmers in Myanmar extensively grow pulses for decades based upon the following reasons.

- (a) A cash crop in the multiple cropping systems.
- (b) A contingent crop when the main crop failed or could not be planted due to unfavorable weather.
- (c) A main crop in the mono-cropped system of central dry zone of Myanmar characterized by inadequate or erratic rainfall.
- (d) A profitable crop under low external input condition with high demand in market.

In the early twenties and thirties, total sown area of pulses was about 0.23 million hectares which was almost equally shared by Pebyugalay, Pegya, Pegyi (lablab bean) and chickpea. Thirty years later, in the sixties and seventies, Pebyugalay and Pegya declined and area under chickpea doubled. At the same time, butter bean, pigeon pea, black gram and green gram, which are previously not grown to any considerable extent, started gaining importance with the area of around 80,000 hectares. The military government took power in 1988 and since then area under black gram, green gram, pigeon pea and cowpea has been increasing and area under chickpea has stabilized around 0.16 million hectares even though market price of chickpea is fairly attractive.

The significant growth of black gram area was achieved as a result of double cropping in lower Myanmar with black gram or green gram following monsoon rice. The area under green gram was also increased in dry zone area of the country with cropping pattern like upland rice and sesame followed by early maturing legume crops during late monsoon.

Pigeon pea, the third most important pulses in Myanmar, is mainly confined to central dry zone of Myanmar and its area has increased because of its drought resistance and its value as a source of fuel wood. It was learnt that one acre of pigeon pea could provide enough fuel wood for a person about one year. Pigeon pea is normally intercropped with sesame without affecting the yield of sesame.

Chickpea is mainly grown as a relay or sequential crop with rice. There are some upland areas where chickpea follows sesame, maize and green gram. The major growing areas of chickpea in Myanmar are Sagaing and Mandalay.

Cowpea is one of the major legumes in Myanmar. It is usually grown after rice or as an upland crop. It was mainly produced in Magway, Yangon, Bago, Mandalay but the largest sown area is observed in Magway Division of central Myanmar. Cowpea may be the hardiest crop among the other pulses so it has great potential to increase the sown area.

At present, 22 different types of pulses are grown in Myanmar of which black gram, green gram, pigeon pea, chickpea and cowpea are major pulses as presented follow.

Table 1 : Pulses Sown Area in 1999-2000

(‘000 ha)

Type	Sown area in 1999-2000	percent of total
Black gram	555	21
Green gram	744	28
Pigeon pea	308	11
Chick pea	131	5
Cowpea	106	4
Soybean	108	4
Others	728	27
Total	2,680	100

Source: Tun Than, Progress report on cooperation in agricultural scheme of peas and bean, MAS.

3. CONSTRAINTS AND LIMITING FACTORS FOR PRODUCTION

3.1. Lack of Quality Seed

Improved seed is one of the major inputs to increase production and improve the grain quality for export. Even though sown area of major pulses is doubled within ten years period starting from 1988, quality seed provided to the farmers is far behind the actual needs. According to the estimation, area coverage of improved varieties is around 30 % for green gram and black gram. In case of underutilized legumes such as kidney bean, butter bean and garden pea, the situation is even worse.

3.2. Lack of Crop Management Optima and Suitable Varieties

To meet rapid market demand, pulses have to be grown in new areas

where soil problems are severe. And certain unique agronomic practices and suitable varieties is a must for good yield. No suitable agronomic practices and varieties are identified and adopted so far for said purpose.

3.3. Transfer of Improved Technology

It is necessary to improve the linkage between research and extension system. The agricultural research system has identified some improved agro-techniques and varieties. Unfortunately, agricultural extension system has difficulties to transfer the technology to the farmers. For instance, *rhizobium is universally recognized for increased yield* but it has not been widely used by the farmers. It may be attributed to the lack of demonstrable result under field condition.

3.4. Narrow Genetic Diversity

Without wide range of genetic diversity no crop can be improved as required. In Myanmar breeders are working with narrow genetic diversities in the area of black gram, soybean, cowpea, kidney bean and lentil. Therefore creating custom-made varieties for new marginal areas with resistance to prevailing abiotic and biotic stresses is impossible at the moment.

3.5. Biotic and Abiotic Stresses

Due to the assured market and relatively higher profit from growing pulses, area under pulses is remarkably increasing. Therefore, pulses area is extended to the new area, which was considered as marginal before. As a result, pulses face abiotic stresses such as alkalinity, salinity, and insufficient or excess soil moisture. Moreover, as a result of extensive growing of pulses in multiple cropping throughout the year, pest and diseases become severe problems. These situations adversely affect the productivity of pulses.

4. EXPORT

4.1. Export Growth

In the olden days, Myanmar grew pulses for the family consumption. Under the colonial rules, as a result of migration of Indian into Myanmar, demand was high and Myanmar extend growing pulses for trading and export to India. After Indo-Pakistan war, Myanmar export market was fallen due to the import restriction of Indian government to save foreign exchange. Myanmar tried to promote export of pulses in international market and achieved the market share in Japan Market. Volume of export of black gram and green gram from Myanmar had taken the share to reach 90% of Japan import in 1960s. After that Japan market was shifted to Thailand between 1970-80 by joint research between Thailand and JSBIA (Japan Sprouting Beans Importers Association) and also due to the lesser production under former centrally planned socialist economy. During 1970s, state monopolized black gram export and smuggler on black gram could be sentenced to death penalty by law. In 1990 Japan market was shifted to China again with favorable Chinese economic policy.

Table 2 : Volume of Pulses Imported by Japan

(mt)

Year	Total Import Volume	Thailand		Myanmar		China	
		Volume	%	Volume	%	Volume	%
1962	24,885	1,002	4	2,230	90	1,234	5
1966	28,954	14,511	50	12,996	45	582	2
1970	36,770	27,758	75	8,622	23	301	1
1974	39,747	25,346	64	14,083	36	26	*
1978	48,042	42,286	88	3,257	7	-	-
1982	58,809	39,666	67	17,952	31	197	*
1986	57,652	35,856	62	12,665	22	8,400	15
1990	52,336	28,884	55	3,593	7	19,519	37
1996	49,376	3,816	8	6,902	14	38,104	77

Source: U Tin Maung Shwe, Deputy Director, DAP and U Sein Win Hlaing, CEC. UMFCCI.

Before 1988, Myanmar export and Import Services (MEIS) controlled the export of all Myanmar agricultural commodities including pulses. After 1988, socialist economic system was replaced with the market-oriented economic system. Government allows farmers freedom of choice in agricultural production and encourages participation of private sector. The trade of pulses was also liberalized both in domestic market as well as for export except for chickpea. In 1998, Myanmar reached the status of third largest exporter of the world (Table 3).

Table 3 : Major Exporters of Pulses (1998)

Country	Export (mt)
Canada	1,688,668
France	1,122,938
Myanmar	800,000
USA	713,278
Australia	513,638
China	472,864
Turkey	354,509
Britain	185,540

Source: FAO, *Trade Year Book*, Vol-52, 1998.

Chickpea exporters have to sell some portion of export volume to the government at fixed price. Since chickpea is the most preferred and useful crop in Myanmar, government want to stabilize the price of chickpea. This policy has been used since around 1994-95. In the long run, this policy encourage farmers to switch to the more profitable crops and consequently, the production of chickpea will tend to decline in future leading to the illegal or legal import from neighboring countries such as India and China. Export of pulses has been steadily increased year by year. The main destinations of pulses exported from Myanmar are Singapore and especially India where pulses is staple food. The list of the exportable pulses of Myanmar in August 2002 is shown in Table 4.

4.2. Value-Added Export

It is necessary to take two important steps to achieve the world market share. The first step is to increase the production. Secondly it is also necessary to emphasize on quality control. It is not enough to get only

Table 4 : The Exportable Pulses of Myanmar (August 2002)

(USD per mt)

Sr.No.	Type of pulses	FOB YGN, FAQ price
1	Black gram	250
2	Green gram	290
3	Pigeon pea	260
4	Cowpea (white)	300
5	Cowpea (Red)	270
6	Butter bean	230
7	Lablab bean	210
8	Kidney bean	250
9	Sultani and Sultipya	220
10	Rice bean	170
11	Duffin Bean	230
12	Soybean	180
13	White chickpea (bold seeded)	260

Source: Pulses Traders Association.

quantitative production. The proper attention should be paid to concentrate on quality drive by applying modern technology. The export prices of most agricultural crops are generally substantially below the world market price, explained by poor varieties and quality and poor access knowledge to international market information.

Pulses are important as a vegetable protein source in the daily diet of the people. The consumption demand is increasing throughout the world. We have to demonstrate the usage of pulses, such as artificial meat, snack and numerous types of food made of pulses.

Pulses market is fluctuated in every year based on weather condition of importing countries and exporter's country. If weather condition is not fair in importing country, production will be low and demand for import will be high for that year. If weather condition is fair, demand for import will be lower for that year. For example, India grows a lot of pigeon pea but not sufficient for local consumption. Myanmar is regular exporter to India and has to compete with Malawi and Tanzania resulting unstable price in that competitive market.

Exporters have to understand the consumer preference. For example, the pigeon pea, grown in Shewbo district is famous in quality for bright

color and big and uniform size. New Delhi consumers prefer Shewbo produce to others. Mahlaing, Kyaukpadaung, Magwe pigeon pea is of small size, red colour, compact and can stand longer storage. Bombay and northern part of India consumers prefer only that produce.

Equal grain size quality is also important factor to perform the value added product for pulses. If we will split or peel pea by machine, unequal size will result in lower outturn, greater loss and unequal size in split peas. Equal maturity is the important factor for green mung bean quality. Mixture of the first and second harvest results in the bad quality. Processing for sizing will produce value-added product for the quality market. It will be better off to export the special quality and first quality instead of fair average quality for quality export.

There is still a big room to produce value-added products such as sweet paste for local and foreign markets, split grain with or without husk, vermicelli, sauce and a variety of snacks. The clear example is processing of split grain, the price of which is almost two times higher than whole grain. The following table shows the price (August 2002) difference between split and whole grain.

Table 5 : The Price Difference Between Split and Whole Grain

(USD per mt, FAQ , FOB Yangon)

Type of pulses	Whole grain	Split without husk	Split with husk
Black gram	250	465	415
Green gram	330	480	430
Pigeon pea	260	390	-

Source: Pulses Traders Association.

There are a few millers for processing black gram, green gram and pigeon pea so far but there are many people who have been involved in chickpea. Most of the chickpea mills are located in Sagaing and Mandalay division.

5. IMPORTS

Garden pea is one of the most favorites pulses in Myanmar and it is well favored and consumed by the royal family in old days. Boiled garden pea with sesame oil and rice or glutinous rice goes together as morning

breakfast for both rural and urban people. Since its growing area is confined only to the area in upper Myanmar, production in Myanmar could not meet the local demand. As a result, garden pea produced in China has been imported through border trade.

During ASEAN-China Summit held at Brunei on November 6, 2001, it was agreed to establish the ASEAN-China Free Trade Area for Early Harvest Program. At the moment, garden pea is included in the sensitive list (SL) under the Common Effective Preferential Tariff (CEPT) Scheme of Early Harvest program with China. After consideration for the benefit of both consumers and producers in Myanmar, it is learnt that Myanmar will exclude garden pea from CEPT very soon for China, WTO member from which Myanmar can get Special and Differential Treatment privilege in return as a developing country.

6. CONSUMPTION PATTERN

Myanmar's basic food requirements are rice, edible oil and salt. In addition, fish, prawn and pulses are the main sources of protein in the diets of people among the both rural and urban poor. Consumption pattern of pulses is varying depending upon the types of pulse and culinary life styles of the consumers.

Most of the domestic chickpea production is used in domestic consumption. Chickpea is the most popular among all people in Myanmar because of its taste, flavor and usefulness. Chickpea processing industry is the most influential one which process split gram and split gram flour. These products are directly used in preparing various kinds of food and snacks. Moreover, these are used as raw materials for food processing plant. Split gram is mostly used for fried split gram. In this process, split gram is cleaned and soaked overnight in water. Then, it is dried in shade and fried. Split gram flour is also used in production of tofu and also one of the major ingredients in *Monhinger* (Vermecilli soup).

Chickpea mills are situated in Sagaing, Mandalay, Bago and Yangon and majority is in Sagaing and Mandalay Division. The chickpea processing plants are very old and simple. First, chickpeas are put into the wooden

tank, which is 9 feet long, 5 feet wide and 5 feet high. Next, spray small amount of water and keep it moistens for 24 hour. Then, chickpea are splitted by roller and separated by standard sieve. The milling outturn for split grain is 75 to 78% in weight depending upon the size and cleanliness of grains. About 10 to 14% is seed coat and 10-12% are smaller broken and powder. The latter two are used for animal feed. The split gram is ground to make flour. Milling outturn of split gram flour is 90% of total split gram weight out of which 70% in high quality, 20% low quality and 10% in gram bran and waste. The ratio between split gram and flour is estimated about 70:30.

All pulses can be used to make noodles, except soybean, lablab bean and horse gram. Well-cleaned pluses are first soaked in water for 24 hours and stirred occasionally. After draining, pulses are ground with a sour starter solution obtained from a previous batch. Than it is settled in a small tank and the liquid is removed. The residual meal is transferred into a wooden tub for 8 hours, it is then transferred into cloth bag, which is hung up to drain out the water for about 15 hours. Then, the material is put into tanks in an airtight room for sulfur fumigation, after which the product is allowed to dry for 2 days, after which a second sulfur fumigation takes place.

After the second fumigation, the product is mixed with a sago solution (starch solution) and extruded into boiling water. The noodles are taken out of the hot water after 5 minutes when they are soft and put into cold water. After that, the noodles are then dried on poles or drying racks for 1 to 2 days. A typical pea noodles mill, uses about 70-100 baskets of pulses daily as raw material, and operates 200-300 working days/year. All of the processes are manual. Grinding is the only mechanical process: it uses electric motors. Generally, one basket (31 kg) of pulses yields 7.35 to 8.17 kg of noodles. The total number of mills is 32 in Monywa, 2 in Mandalay, 2 in Shwebo, and 2 in Bago division in 1998.

Green gram and black gram are mostly used in bean sprout industry. In case of pigeon pea, few Myanmar people consume pigeon pea except Indian descendents because they are not used to consuming pigeon pea. In the central dry zone area, characterized by relatively high price of

rice, rural people cook rice mixed with pigeon pea to save money. Other pulses mixed with rice are used as breakfast for both rural and urban people. Lentil soup with vermicelli made of pea is very popular dish among the urban people. Boiled garden pea with a splash of edible oil normally goes with glutinous rice and rice for the breakfast. Cowpea and Lima bean are also used the same as garden pea. Fried lablab bean is consumed as a snack and one the major ingredients in pickled tea. The waste product from harvesting and threshing such as leaves, unfilled pod, damaged grain of pulses is also widely used for animal feed in Myanmar.

Using production and export data from 1999-2000 for all pulses, it was observed that 34% of the total pulses production was exported. In case of pigeon pea based upon the five years average, about 80% of production was exported. Pulses consumption may vary depending upon the ethnic group. For instance, Shan, one of the national races of Myanmar and Chinese descendents prefer to consume variety of soybean-based food compared to other ethnic groups. The following table summaries present the usage of the pulses in various ways.

Table 6 : The Usage of The Pulses

Type of pulses	Usage
Chickpea	Flour, Vermicelli, Tofu, Curry, Snack,
Black gram	Bean sprout, Vermicelli
Pigeon pea	Curry, Crispy
Green gram	Vermicelli, Sprout, Curry
Cowpea	Sweet paste, Snack
Soybean	Tofu, Sauce, Fermented bean curd, Fermented grain, Soya milk
Lablab bean	Crispy, Curry

Source: The Study Group.

Peas and beans constitute a very important daily protein intake for the people of Myanmar, especially for the low-income group. Fortunately, about 20 food legume cultivars are sown in Myanmar under the different agro-ecological zones. Among these cultivars, chickpea, garden pea, lablab bean, lima beans, cowpea and soybean are the most preferred among the people of Myanmar. An academician calculated the percentage composition of food legumes in Myanmar diet as follow.

Table 7 : The Percentage Composition of Food Legums

Sr. No.	Food Legumes	Percentage
1	Chickpea	29.0
2	Peas	16.9
3	Colored lima bean (Sultini/pya)	10.3
4	Lablab Bean	9.3
5	White lima bean (Pepyugalay)	8.0
6	Pigeon pea	6.4
7	Soybean	4.7
8	Black gram	3.6
9	Cowpea (Pelun and Bocate)	4.7
10	Others	7.1
	Total	100.0

Source: n.a.

7. COMPARATIVE ADVANTAGE OF PULSES

Pulses are profitable crops for the resource poor farmers. Pulses have comparative advantage than other crops such as rice and maize from the viewpoint of resource use efficiency including financial resource and natural resource.

In order to get 1 metric ton of green gram, roughly it is necessary to grow 3 acres of green gram. Assuming that production cost for 1 acre of green gram is 13,870 Kyats, total production cost for 3 acres of green gram is 41,610 Kyats. Since price for one metric ton of green gram on FOB Yangon basic is 250 US dollars, it is necessary to spend 166 Kyats in order to get one US dollar. Using the same calculation method, it needs to spend 211 Kyats for rice to get one US dollar. It is obvious that grow pulses has much more comparative advantage than growing rice.

The systemic comparative advantage of black gram and green gram in Myanmar was made by Aye Aye Mon, economist from Department of Agriculture Planning. Her paper concentrates on comparison among pulses growing regions and on implication derived from using the policy analysis matrix (PAM) methods. The comparative advantage is measured using Domestic Resource Cost (DRC) method. The analyses focus on

comparative advantages of the black gram production in Hinthata (Ayeyarwady Division), Pyinmana (Mandalay Division) and also green gram production in Thonegwa (Yangon Division) and Magway (Magway Division). These regions were selected on the basis of sown area and market center in relation to regions. In that study carried out in July and August 2000, Domestic Resource Cost ratios for black gram and green gram production in four study regions show that there is a comparative advantage for producing these crops even at the present yield level. Further study on comparative advantage of various pulses are being conducted by the Study Group of Agro-based Industry.

Water becomes strategic natural resource for some countries even though Myanmar has huge natural reserve for water. Sooner or later, water could be a limiting factor for increase food production in Myanmar especially when industry sector demand more water along with industrial and social sector development. In order to grow one unit area of pulses, only 20% of water required to grow one unit area of rice is necessary. It could clearly be seen how ecology-friendly it is.

8. MARKETING

In Myanmar the food grain trade has been a state monopoly until 1988. The trading of agricultural products such as rice, wheat, maize, pulses and selected crops was brought under direct control of government in line with the centrally planned economy. The government agencies namely Myanmar Agricultural Produce Trading (MAPT) and Myanmar Export and Import Services (MEIS) were the major agencies in agricultural marketing.

After 1988, market economy was adopted and procurement and marketing, transporting and storage of crops were liberalized. The government is also encouraging private sector participation in agricultural activities including export. Therefore the present market structure of pulses in Myanmar consists of state economic enterprises, cooperatives, joint ventures and private traders. The state economic enterprises purchase pulses from all available sources such as traders, cooperatives, middlemen and farmers. The remaining actors have their own commissioned

agents or brokers and they also buy from individual traders. Farmers sell their products to brokers who come to village or go to the nearest town to sell their products in the brokers house or market. Sometimes cash needy poor farmers are forced to sell their products before harvest regardless of price.

As a result of assured market in international trade and market oriented economic system adopted Myanmar, pulses production and export increase remarkably. In 1999-2000 total sown area of pulses has already reached about 2.7 million hectares with the production of about 2 million metric ton and export volume of nearly 800,000 metric ton to over 11 countries. Among ASEAN member countries Myanmar's average annual growth rate for pulses harvested area is the highest.

Table 8 : Peas and Beans Area Harvested in ASEAN Countries

('000 ha)

Country	1989	1996	1997	1998	1999	Average Annual Growth Rate(%) (89-99)
Cambodia	26.0	26.8	27.1	25.0	25.0	0.2
Indonesia	467.0	534.0	543.0	563.0	563.0	1.36
Laos	15.0	14.7	15.5	15.6	15.2	(-) 0.2
Myanmar	518.4	1,852.4	1,726.0	1,838.3	2,190.1	14.3
Philippines	65.9	76.0	76.0	76.0	76.0	2.0
Thailand	651.4	415.4	385.4	423.0	428.0	(-) 4.3
Vietnam	290.0	325.0	340.0	357.5	357.5	2.2

Source : RAP Publication 2000/15.

As evidence shown in above table, area expansion for pulses is not impressive in the other ASEAN countries. It may be due to limited area and other competitive economically important crops for individual country's interest. Moreover, land use pattern may be changed from agriculture to urban land use to accommodate industrialization and urbanization. But it is to note that yield per area of pulses in other ASEAN countries such as Indonesia is higher than that of Myanmar.

Therefore, Myanmar may be the only country, which can produce more pulses for food and animal feed in years to come. Due to the abundance of land and water resources and introduction of short duration rice varieties, pulses growing area can easily reached about 3 million hectares in near future. Therefore, Myanmar has immense possibilities of extending pulses exportation. But due to the increase globalization phenomenon in the international market, challenge of increasing competition is also becoming immense particularly for high quality products.

To cope with this situation and remain competitive in the international market, Myanmar has to improve the quality of present exporting pulses and to find new market whether it is low or high end other than India. It is also necessary and imperative to find a place in the export market for new species of pulses other than the existing traded species, which are commonly traded by other country.

In this connection, soybean, which has been grown for more than 10,000 hactares in Myanmar, could be potential crop because of its wider market. Strong potential for processing exits, as soybean provides both protein and edible oil, as its main components. Culture and geography are the main determinants of the end uses for soybean. In South Asian countries, the main use is an oilseed, with de-oiled meal often being exported mainly for cattle feed. In Southeast Asian, and East Asian countries such as Japan, soybeans are consumed directly or in formulated products, as they are an excellent source of dietary protein in human food. Since international market's demand for processed form is increasing, Myanmar has to learn the processing technology and find the market places for processed form of pulses.

9. HUMAN RESOURCES DEVELOPMENT IN PULSES INDUSTRY

There are 22 different pulses belong to 16 botanical species grown annually in Myanmar since long time ago. Although yield of these crops were much lower than their potential, no enough effort was made to improve the productivity of these crops before 1976. Food legumes research division was established in 1976 and necessary research plans had been laid down according to immediate and long term needs. With respect to their economic importance and sown area, chickpea, pigeon

pea, black gram, green gram, cowpea, and lima bean were recognized as major pluses of Myanmar and research priority are given accordingly.

Soon after the establishment of food legumes Research Division, national pulses development programs through Crop Development Project (CDP) and Food Crop Development Project (FCDP) were launched. During these projects national research workers and township managers from extension division were trained under the guidance of international expert working under the project. Moreover, some research workers were sent to international institutions and research centers such as ICRISAT for short-term trainings relating to crop improvement, crop management and plant diseases control. And then Myanmar becomes a member country of CLAN (Cereals and Legumes Asian Network) that was one of the collaborative activities of ICRISAT. Due to this CLAN program some research and extension workers got opportunities to learn legume improvement techniques and related areas such as crop management, and production.

9.1. Current Status of HRD in Pulses Production

Since rice is the priority crop in Myanmar, more attention was given to the HRD for rice. As a result, sizable number of trained persons on rice was produced whereas pulse sector has relatively few trained personnel and no post-degree holders practically working in the area of pulses. According to the available information from MAS, there are about 30 persons who took part in short course in various disciplines for pulses. Detail information by discipline-wise is as presented follow.

Table 9 : Number of Trained Persons

Discipline	No. of trained person
Breeding	11
Seed science	8
Crop management	7
Crop protection	3
Total	29

Source: MAS.

Moreover, more than 300 trainees from both extension and research divisions of MAS were successfully trained at Central Agricultural Research and Training Center (CARTC).

9.2. Future HRD Program of Pulses

Total sown area of pulses in Myanmar has been drastically increased and new areas where pulses have never been grown are put under pulses cultivation for expansion of area horizontally. But, the appropriate technology such as improved seeds, agronomic practices and crop protection measure suitable for the newly extended area are not identified yet. It is obvious that research works that can answer the above questions are in urgent needs.

The successful production of pulses in the future will depend upon the *identification and selection of appropriate rhizobium strains*, which are variety-specific for high yield. At the same time, trained technicians for identification of proper production technique for effective inoculums are also as important as selection of appropriate strain. Moreover, there is a need to conduct research on cropping system, which could be well fitted with pulse.

In order to fulfill the said objectives, following highly trained person-nels are in urgent needs. It is to note that person-nels required mentioned below are minimum requirement.

Table 10 : Minimum Requirement of Highly Trained Persons

Sr. No.	Particulars	Persons required	Area of specialization
1	Ph.D	2	Breeding mainly for <i>vigna</i> species
2	M.Sc	4	Entomologist/ Pathologist / Agronomist and Microbiologist specialized in Rhizobium
3	M.Sc	3	Breeding for <i>Vigna</i> species / Chickpea / Pigeon pea

Source : MAS.

There is a saying that research makes the difference. If it is true, human resource development in research sector is crucial and priority for further development. In this connection, there must be incentives for the researcher who devotedly work in the area of research. Under the present situation, few capable people want to work in the relatively remote area. The administrators and policy makers should think seriously about this type of issue and try to solve the problem.

10. CONCLUSION

Myanmar is an agricultural country and its economy will continue to depend on the agricultural production in the foreseeable future. About 34% of the total GDP in 1999-2000 comes from agricultural sector. At present, pulses play an important role in earning foreign currency. Myanmar, with relatively favorable land and population ratio, has a potential for increasing the pulses production. However, the increased production still has several problems such as varieties, agro-technology, post-harvest technology, storage, processing and marketing system.

It is clear that increased production in Myanmar is mainly dependent on the export market. The most encouraging factor for farmers to grow pulses is the profitability of growing such kind of crops, low risk and low investment. It is therefore imperative that price and market stability are essential for increased production. So far the increased production of pulses was mainly due to the horizontal expansion (expansion of sown area). Area expansion could be done up to some extent because of limited land resources and the other competitive crops in season. Therefore, it is important to emphasize on vertical expansion (increased land productivity). This cannot be done without research and development programs on pulses research. The approach to productivity problems should be *strongly based on improving variety and reducing the post-harvest losses.*

Pulses sown area, production and productivity are highly responsive to cost and benefit of producing pulses. Costs of production are getting higher and higher due to increasing costs of inputs and labours. *Increased productivity is the only way to reduce the cost of production otherwise*

the farmers cannot compete in the international market.

With the approach of AFTA and Globalization, *it is necessary to recognize the urgent need to improve the quality of pulses.* Use of improved seed processing plants, proper storage facility to effectively control for moisture, pests and diseases, improvement in post-harvest technology at farm level, proper transportation to shorten the time between port of shipment and port of destination to avoid risks for damages and quality, and use of ships and containers free from holes to avoid the damage caused by rain water are some of the important points. Proper attention must be paid to consider for the improvement of quality of pulses exports in international market. At the same time, Myanmar should not rely totally on India market and try to find other potential markets.