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World Food Programme

S P E C I A L R E P O R T

FAO/WFP CROP AND FOOD SECURITY ASSESSMENT MISSION TO MYANMAR

16 March 2016

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD FOOD PROGRAMME
Rome, 2016

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Acronyms

AEZ	Agro-Ecological Zones
ACF	Action Against Hunger
ARI	Acute Respiratory Infection
ASEAN	Association of Southeast Asian Nations
CBM	Central Bank of Myanmar
CFSAM	Crop and Food Security Assessment Mission
CSO	Central Statistical Organization
DMH	Department of Meteorology and Hydrology
DoA	Department of Agriculture
EC	European Commission
EPR	Emergency Preparedness and Response
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot-and-Mouth Disease
FSMS	Food Security Monitoring System
GAM	Global Acute Malnutrition
GDP	Gross Domestic Product
GIEWS	Global Information and Early Warning System
ha	Hectare
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDP	Internally-Displaced Persons
IHLCA	Integrated Household Living Conditions Assessment
JRC	Joint Research Centre
KCl	Potash
LBW	Low Birth Weight
MADB	Myanmar Agricultural Development Bank
MAM	Moderate Acute Malnutrition
MICS	Multiple Indicator Cluster Survey
MoAL	Ministry of Agriculture and Irrigation
MLFRD	Ministry of Livestock, Fisheries and Rural Development
MMK	Myanmar Kyat
NPAFN	National Plan of Action for Food and Nutrition
MRMA	Myanmar Rice Millers Association
MRPTA	Myanmar Rice and Paddy Traders Association
MUAC	Mid-Upper Arm Circumference
NDVI	Normalized Difference Vegetation Index
NGOs	Non-Governmental Organizations
OCHA	Office for the Coordination of Humanitarian Affairs of the United Nations
OTP	Out-patient Therapeutic Programme
PHL	Post-Harvest Losses
SAM	Severe Acute Malnutrition
SCI	Save the Children International
SEZ	Special Economic Zone
SPHERE	SPHERE Project
SLRD	Settlement and Land Record Department
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TSP	Triple Super Phosphate
UN-DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Emergency Fund
UNSCN	United Nations Standing Committee on Nutrition
USD	US dollar
WFP	World Food Programme
WHO	World Health Organization

Highlights

- Cyclone Komen made landfall in Myanmar at the end of July 2015 causing extensive flooding to agricultural land, which remained submerged in some areas until September. This caused severe localized losses to the 2015 monsoon season crops, especially paddy, in Chin, Rakhine, Ayeyarwaddy, Yangon, Sagaing and parts of Bago. However, once the water receded, a large portion of the flooded areas with paddy was replanted. Overall, the amount of irreversible damage was limited.
- At 27.5 million tonnes, the aggregate national production of paddy, the country's staple food, in 2015 (monsoon season 2015 and ongoing 2015 secondary season) would be 3 percent below the 2014 crop and 2 percent down from the average of the past three-years.
- At subnational level, however, cereal production and livelihood of farming households and communities in remote areas, in particular Chin and Rakhine, which concentrate highly vulnerable populations with little resilience and low agricultural productivity, did not recover fully as in other areas affected by the flooding. These populations may face severe food shortages in the coming months and require relief assistance.
- Livestock and fisheries were affected by the flooding in localized areas with losses of cattle, buffalo, sheep, goats, pigs and poultry, and damage to fish and shrimp farms, resulting in reduced animal protein intake in the most affected areas.
- The country is a net exporter of rice and the 2015 paddy production, similar to previous years, will exceed domestic requirements, but tighter domestic supplies in marketing year 2015/16 (October/September) are expected to further underpin already high rice prices, raising concerns about food access by most vulnerable sections of the population.
- Prices of rice reached record levels in August and September 2015, reflecting strong depreciation of the Kyat, increasing rice exports and concerns about the damage to paddy crop. Domestic rice prices declined with the harvest between October and December 2015 but remained at high levels. In February 2016, rice prices averaged 37 percent higher than a year earlier.
- For the majority of farming households, the main impact of the July flooding was related to the increased costs for replanting and the delayed harvest. Households depending primarily upon day labour, and especially non-skilled day labour, remain among the most vulnerable. They faced a gap in wages during August and have difficulties in obtaining credit.
- The July flooding was perceived to have moderate impact on children's nutritional status and little impact on infant and young children feeding practices.
- In view of the country's adequate rice availabilities and generally well-functioning domestic markets, the Mission recommends that any eventual food assistance needs to be provided in the form of cash and/or vouchers.
- To cover immediate agricultural needs following the 2015 flooding, the Mission recommends the distribution of seeds for the next monsoon planting season; as well as water and pest-resistant storage containers to protect farmer's seeds, along with drying nets and post-harvest equipment in the most affected areas. In Rakhine, Sagaing and Ayeyarwaddy, recording the highest livestock losses, urgent restocking of livestock is required to avoid a further fall in animal protein intake; while the rebuilding of fishing gear and boats and the rehabilitation of fish ponds is also needed in the most affected Rakhine State.

1. OVERVIEW

An FAO/WFP Crop and Food Security Assessment Mission (CFSAM) visited Myanmar from 24 November to 10 December 2015 at the invitation of the Myanmar's Ministry of Agriculture and Irrigation (MoAI) to forecast the 2015 cereal production (2015 main *monsoon* and ongoing 2015 secondary *summer* season) and to evaluate the prospective food security and nutrition situation. The invitation was prompted by the extensive severe flooding caused by heavy rains and the passage of Cyclone Komen at the end of July 2015, which resulted in considerable damage to agricultural land, livestock, fishery/aquaculture and infrastructure. The Mission aimed specifically to assess the impact of the floods on the 2015 main-crop harvest, to ascertain whether there would be a food shortage in the 2015/16 marketing year (October/September) and, if so, to quantify it, and to identify the country's nutritional and agricultural support needs until the next main harvest. The Mission included three international FAO staff, three international WFP staff and a number of national staff from both agencies. The Mission was accompanied for one week by an observer from the European Commission's Joint Research Centre (EC/JRC).

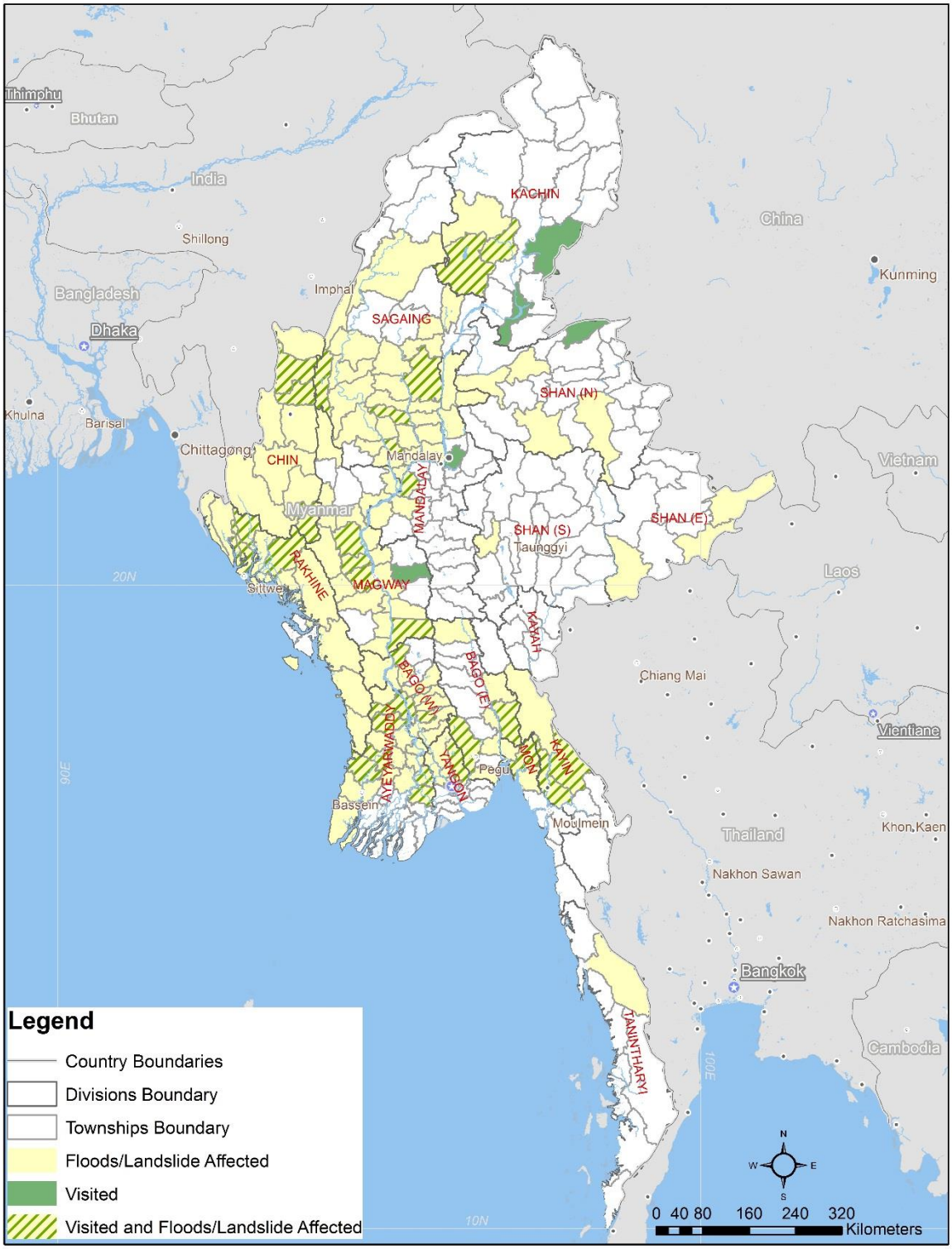
The Mission visited the country at the time of the 2015 main season harvest, travelling to 11 of Myanmar's 15 regions/states, except Mon and Kayah States, Taninthery Region and Nay Pyi Taw Union Territory, which were less affected by the floods (see Figure 1). In order to cover such a wide geographical area in the limited time available, the Mission split into three separate teams. The teams spent 11 days in the field, from 25 November to 5 December 2015, and then gathered in Nay Pyi Taw to consolidate the information gathered and to de-brief the Government on 8 December 2015. A de-briefing of donor agencies was conducted in Yangon on 9 December 2015.

The Mission's findings were based on five main data sources:

- Institutional meetings with Government agencies: the Ministry of Agriculture and Irrigation (MoAI), the Central Statistical Organization (CSO), the Department of Meteorology and Hydrology (DMH), the Ministry of Livestock, Fisheries and Rural Development (MLFRD), the Myanmar Rice Millers Association (MRMA), the Myanmar Rice and Paddy Traders Association (MRPTA), and district-level health and nutrition officials.
- Structured interviews with staff from District and Township Departments of Agriculture (DoA), Settlement and Land Record Department (SLRD), Livestock, Breeding and Veterinary Departments, groups of farmers, rice millers, rice traders, seed farmers, fish farmers, health clinics, and rural households.
- Normalized Difference Vegetation Index (NDVI) images, estimated rainfall and other remotely sensed meteorological data provided by FAO/GIEWS. These were compared with local rain-gauge data and growing conditions reported in interviews.
- Market survey: market-price trends and structured interviews with traders.
- The WFP Myanmar Country Office and sub-offices coordinated and implemented a small-scale (non-representative) survey to collect additional household-level data related to food security and nutrition that was also used to support the findings of the Mission.

The Mission's field observations were triangulated with official data provided by Government agencies in order to come up to an objective and impartial assessment of the country's crop and livestock situation, the extent of the damage caused by Cyclone Komen, and the degree to which the rural population had been able to recover. Particular emphasis was placed on assessing how the floods had affected the level of access to food by the population in general and by rural households in particular.

Figure 1: Myanmar - Affected townships visited by FAO and WFP



The monsoon season started slowly, but rains increased significantly from mid-July and were further intensified by Cyclone Komen on 30 July 2015, causing severe flooding and devastation in parts of the country. Hardest hit states/regions were Ayeyarwaddy, Yangon, parts of Bago, Chin, Rakhine, Sagaing and Magwe, the latter four were officially declared natural-disaster-affected zones on 31 July (see Figure 1). The floods destroyed localized areas of monsoon crops, mainly paddy, with some areas requiring up to three replantings and other areas having to change to different, later-planted crops; a relatively small area of crop land had to be abandoned completely. Crop pest and disease levels were reported to be mostly normal for the 2015 main season.

The Mission concluded that the floods and the passage of Cyclone Komen had caused significant damage to crops, agricultural land, livestock, fish and shrimp farms, housing and livelihoods, but in general, the overall amount of irreversible damage was limited. Partly because such events are not infrequent, albeit they are usually less severe, farmers and others who had been affected were generally (though not always) able to make a good recovery. However, the livelihood of farming households and communities in remote areas, including Chin and Rakhine, which concentrate highly vulnerable populations with little resilience and low agricultural productivity, did not recover fully as in other areas affected by the flooding.

The 2015 main season paddy crop is estimated by the Mission at 22.8 million tonnes, 4 percent below the corresponding season in 2014, mainly as a result of area and yield cuts following the floods in July and August. The 2015 secondary (locally called 'summer') season paddy, sown between late December and February and due to be harvested in April-May 2016, is considered unlikely to be affected by any long-term effects of the floods. Assuming average yields and a recovery in planted area from last year's reduced level, the output of the 2015 secondary *summer* crop is projected to increase by 5 percent year-on-year to 4.7 million tonnes. In aggregate, production of paddy in 2015, including the 2015 monsoon season and the ongoing 2015 secondary *summer* season, is forecast by the Mission at 27.5 million tonnes, which is 3 percent lower than the previous year's output and 2 percent lower than the three-year average. Lucrative 2016 winter cash crops, including sesame, groundnut and pulses, have, however, suffered from late planting in many affected areas as a result of the delayed harvest of the re-planted 2015 monsoon paddy.

Although the 2015 paddy production will exceed domestic requirements at national level, as the country is a net exporter of rice, in some areas that sustained serious storm and flood damage, especially in Chin and Rakhine, where annual paddy production is estimated to fall by 14 and 15 percent respectively, there are pockets where people may face severe food shortages in the coming months and may require relief assistance.

In view of adequate rice availability and generally well-functioning domestic markets within Myanmar, it is recommended that such assistance be provided in the form of cash and/or vouchers. In some areas, including Ayeyarwaddy, Chin and Rakhine, additional production support is required to re-establish means of livelihood. The immediate needs include: distribution of seeds for the next monsoon planting season; water and pest-resistant storage containers to protect farmer's seeds, along with drying nets and post-harvest equipment; urgent restocking of livestock to avoid a fall in animal protein intake; distribution of fishing equipment, rebuild fishing gear and boats, rehabilitation of fish ponds and increased the availability of smaller farm machinery for hire.

The sharp depreciation of the MMK, which supported strong import demand from China, coupled with higher labour costs and concerns about the flood-related crop losses caused rice prices to increase to record high levels in most markets in August-September 2015. In addition, trade flow disruptions in the remote areas, on account of damages to transport infrastructure, was a further contributing factor to the price increases in these parts during August and September. Domestic rice prices weakened between October and December 2015 with the main season harvest, but remained at high levels in both nominal and real terms and in February 2016 were 37 percent higher than a year earlier. Tighter paddy domestic supplies in marketing year 2015/16 (October/September) compared to last year, reflecting flood related crop losses, are expected to maintain strong upward pressure on rice prices in 2016.

Livestock conditions at the time of the Mission across most of the country were reported to be generally satisfactory. However, in localized areas the impact of the cyclone was severe with Rakhine, Sagaing and Ayeyarwaddy recording the highest livestock losses.

Fisheries and aquaculture conditions at the time of the Mission were generally satisfactory, but there is an immediate need to rebuild fishing gear and boats and rehabilitate fish ponds in the most affected Rakhine State.

The impact of the flooding on livelihoods varied for farming and non-farming households and also according to households' access to financial services and credit. The main impact for farming households, aside from the small proportion which experienced a total loss, was the financial burden of purchasing the additional agricultural inputs required for replanting. Meanwhile, households depending on skilled agricultural labour were required to borrow rice or credit from neighbours and private lenders in order to bridge the income gap which followed from delayed replanting and harvesting activities. While all groups reported a decrease in year-on-year income, farming households which did manage to harvest will be able to parlay higher farm gate prices for paddy into higher incomes for the 2015 monsoon season.

The July 2015 flooding in Myanmar had a moderate impact on child nutritional status and a limited effect on infant and young children feeding practices. The flooding exacerbated vulnerability towards malnutrition in areas of Myanmar where children were already malnourished (Rakhine and Chin). This vulnerability combined with an important increase in morbidity can have long lasting consequences on children's growth.

To cover immediate needs following the 2015 flooding, the Mission recommends the distribution of seeds for the next monsoon planting seasons in the most affected areas, including Chin, Rakhine and Ayeyarwaddy; as well as water and pest-resistant storage containers to protect farmer's seeds, along with drying nets and post-harvest equipment. In Rakhine, Sagaing, Magwe and Ayeyarwaddy, recording the highest livestock losses, urgent replacement of livestock is required to avoid a fall in animal protein intake; while the rebuilding of fishing gear and boats, and rehabilitation of fish ponds is needed in the most affected Rakhine State.

There is also a need to closely monitor the food situation in pocket areas, particularly in Rakhine and Chin, where food assistance may be required. In view of the adequate rice availability and generally well-functioning domestic markets within Myanmar, the Mission recommends that in case such assistance be needed, it be provided in the form of cash and/or vouchers.

2. SOCIO-ECONOMIC CONTEXT

2.1 General

Myanmar has a total land area of 676 578 km^2. The country is bordered by Bangladesh, China, India, the Lao People's Democratic Republic and Thailand, and by 2 800 km of coastline along the eastern side of the Bay of Bengal. The population is predominantly rural, with around 60 percent dependent on subsistence agriculture, mainly rice growing, for their livelihoods. Volatility in agricultural production remains a major challenge in maintaining a stable economy and improving the living standards of the population. In 2014, the agricultural output accounted for 31 percent of Gross Domestic Product (GDP), the service sector for 22 percent and the industrial and manufacturing sectors for 29 percent. Myanmar is classified as a lower-middle-income country, with a GDP per capita of USD 1 270 at purchasing-power parity (World Bank 2014), one of the lowest in the region. The Gini coefficient of 0.29 implies a relatively low disparity between household incomes compared with neighbouring countries. However, rates of poverty remain high, with an estimated 37.5 percent of the population living below the poverty line. Most of the poor live in rural areas and are predominantly concentrated in conflict-affected areas such as Chin and Rakhine States, both of which have substantial numbers of ethnic minorities.

2.2 Recent macro-economic trends

Myanmar's economic growth, measured by real GDP, increased from 4.8 percent in 2011 to 6.6 percent in 2015 (Table 1. In the space of just a few years almost every aspect of life has been affected by fundamental economic reforms aimed at increasing openness and empowerment of the country. Increased gas production and exports, and stronger performance in non-gas sectors as the economy opened up, also contributed to this overall economic growth. The economic outlook for 2016 and 2017 remains positive, with expectations that continuing progress on regulatory and legal reforms, rapid growth in telecommunications and the launch of several Special Economic Zones (SEZs), such as the Thilawa SEZ, will further attract foreign investment. Available statistics indicate that, although exports increased over the last five years, amounting to USD 9 083 million in 2014, imports increased even more in the previous three years, leading to an annual trade deficit of USD 3 005 million in 2014.

Table 1: Myanmar - Key economic indicators, 2011-2015

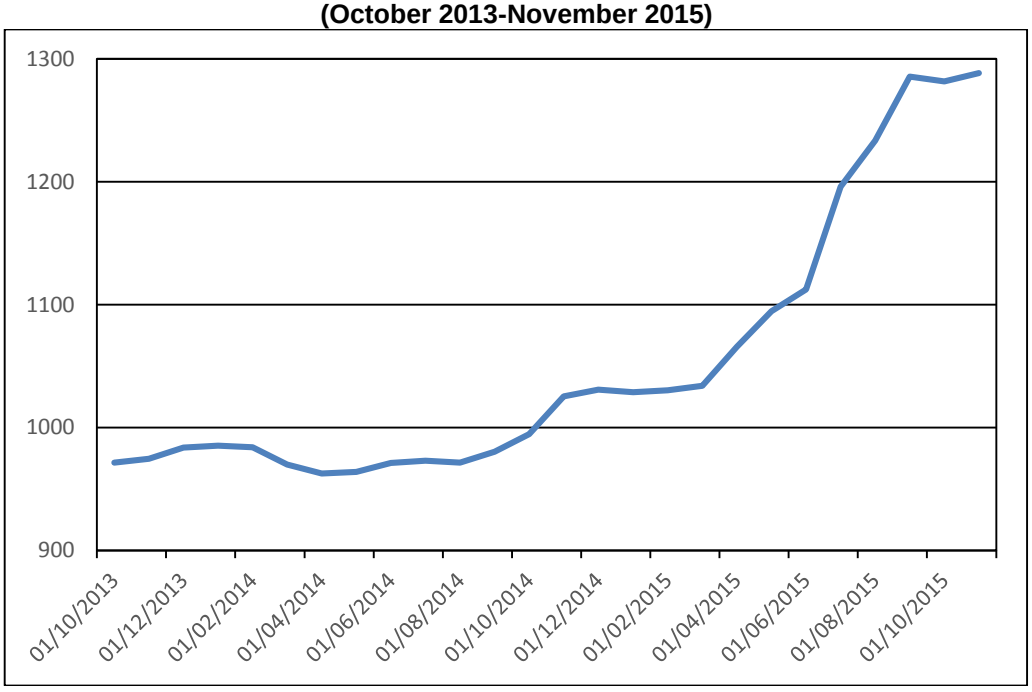
Domestic economy	2011	2012	2012	2014	2015
Real GDP growth (percent)	4.8	5	5.5	6.4	6.6
Average consumer price inflation (percent)	0.7	6	4.4	7.1	10.2
Exports of goods (USD million)	7 699	8 220	9 404	9 083	9 565
Imports of goods (USD million)	7 491	7 629	9 518	12 088	12 268
Trade surplus or deficit (USD million)	208	591	-114	-3 005	-2 703
Average exchange rate MMK/USD	815	852.35	933.63	984.35	1 159.09

Source: Economic Intelligence Unit (EIU) Country Report (November 2015).

2.3 Exchange rate

After a period of 11 consecutive months of relatively stable currency values, the MMK began to depreciate rather strongly between September 2014 and October 2015 (see Figure 2). A reduction in foreign reserves, due to a widening trade deficit, as result of higher import volumes, which outpaced revenues from exports, provided support for the weakening of the local currency. Inflows of foreign currency from tourism as well as rising levels of foreign direct investment provided some cushion, but were not enough to fully plug the growing trade deficit. The Central Bank of Myanmar (CBM) has taken steps since May 2015 to stem the demand for US dollars, in order to support the MMK, such as revoking the number of foreign-exchange licences. This has resulted in slowing or reversing the rate of depreciation of the MMK between October 2015 and January 2016.

Figure 2: Myanmar - Exchange rate MMK/USD (October 2013-November 2015)



2.4 Population

The population of Myanmar in 2015 is estimated at 53.897 million persons, with an annual growth rate of approximately 0.8 percent during the preceding five years (UN Department of Economic and Social Affairs, December 2015). The majority of population live in rural areas, with a relatively low population density of 82 people per km^2. Around 30 percent of the population reside in urban areas. Myanmar is ethnically diverse, with eight major ethnic groups, 135 subgroups and 108 different ethno-linguistic groups. The country's employment-to-population ratio, which is defined as the ratio of the total labour force currently employed to the total working-age population (15-64 years) is 64 percent.

2.5 Poverty

The country's poverty rate is currently estimated at 37.5 percent of the population and is higher in rural areas, where around 70 percent of the population live under the poverty line. Among ASEAN countries, Myanmar is still one of the poorest, with the lowest life expectancy estimated at 66 years (World Bank, 2013) and the second-highest rate of infant and child mortality currently estimated at 40 deaths per 1 000 live births (World Bank, 2015). Poor rural households are highly vulnerable to saline water intrusion near the sea and adverse weather conditions, including floods and droughts. While Myanmar produces a surplus of food in aggregate terms, many rural areas suffer from chronic and acute food insecurity (UNDP, 2014). The rural poor mainly consist of the landless, farmers with access to small landholdings (usually less than 2 hectares), and disadvantaged ethnic groups. Many poor ethnic groups in remote hilly areas have limited access to arable land and have been affected by conflict.

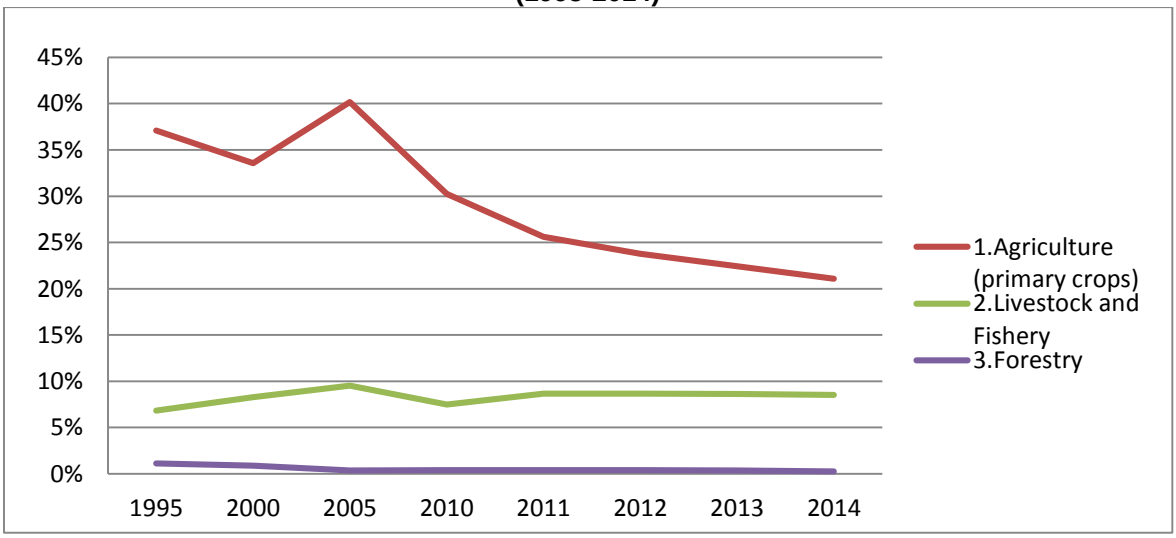
3. AGRICULTURE

3.1 General

Myanmar is an agricultural country well-endowed with land, a generally favourable climate and plentiful water resources for agricultural production. The agriculture sector plays an extremely important role in the economy and is the main source of income for about 60 percent of the working population. The importance of primary agricultural production in terms of GDP is declining. In 1995, agricultural output accounted for 45 percent of GDP; by 2014 it had shrunk to 30 percent. This decrease reflects primarily a decline in the share of primary crops, such as cereals, which contracted from 37 percent of GDP in 1995 to 21 percent 20 years later. At the same time, share of the livestock and fisheries sector increased from 7 percent to 9 percent (Figure 3). The industry sector's GDP increased from 16 percent in 1995 to 29 percent in 2014, mainly mirroring an increase in the processing and manufacturing subsector.

The Government of Myanmar identified agricultural development and food security as the country's key pillars supporting and enabling inclusive and sustained economic growth, as promulgated in several publications[1]. However, limited institutional capacity, not always available data and information (such as rice consumption and stocks and full cereal balance), coupled with a low number of in-country experts who can effectively act upon information, have often led to overly ambitious targets for agriculture and its subsectors. Furthermore, limited domestic resources have resulted in under-investment for nearly two decades.

Figure 3: Myanmar - Percentage share of GDP by agriculture, livestock, fishery and forestry (1995-2014)

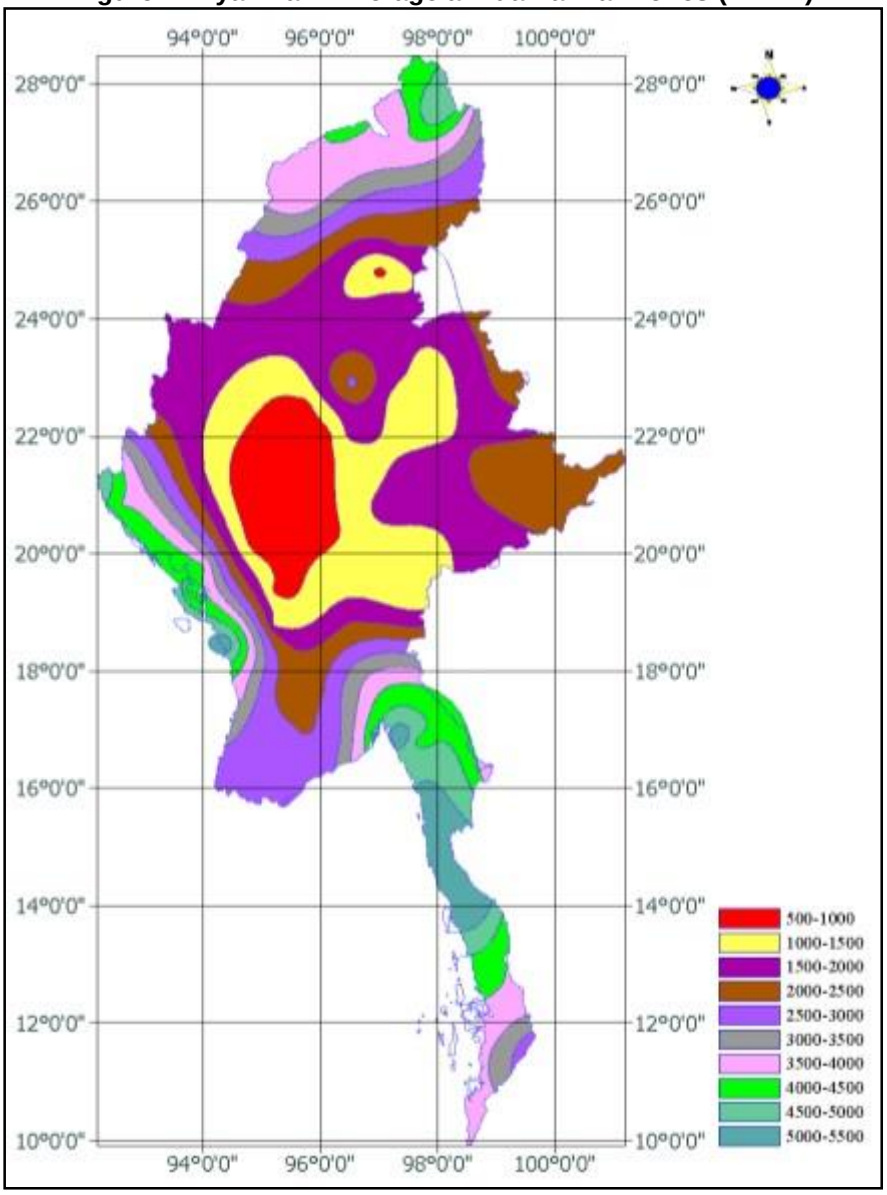


Source: Myanmar Statistical Information Service.

[1] a. The Government of the Republic of Myanmar, 2011. Poverty Alleviation and Rural Development Action Plan. Nay Pyi Taw.
b. The Government of the Republic of Myanmar, 2013. Framework for Economic and Social Reforms. Nay Pyi Taw.
c. The Government of the Republic of Myanmar, 2013. National Comprehensive Development Plan. Nay Pyi Taw.
d. The Government of the Republic of Myanmar Ministry of Livestock, Fisheries and Rural Development, 2014. Rural Development Strategic Framework. Nay Pyi Taw.

Myanmar can be divided into four major Agro-Ecological Zones (AEZs): Deltaic Zone, Coastal Zone, Central Dry Zone and Mountain Zone. The Central Dry Zone is an extensive semi-arid lowland between two higher regions, the Shan plateau in the East and the Rakhine Yoma and Chin Hills in the west. Annual rainfall varies significantly across the country, with levels of up to 5 500 mm in the Mountain, Coastal and Deltaic Zones and only 600 mm in the Central Dry Zone. There is also significant spatial variability in temperature, with highs of above 43C in Central Myanmar, around 36C in Northern Myanmar and only 29C on the eastern plateau. The rainy season extends from May to October, and the weather is generally dry during the rest of the year. Figure 4 shows the different climate zones as defined by their annual rainfall.

Figure 4: Myanmar - Average annual rainfall zones (in mm)



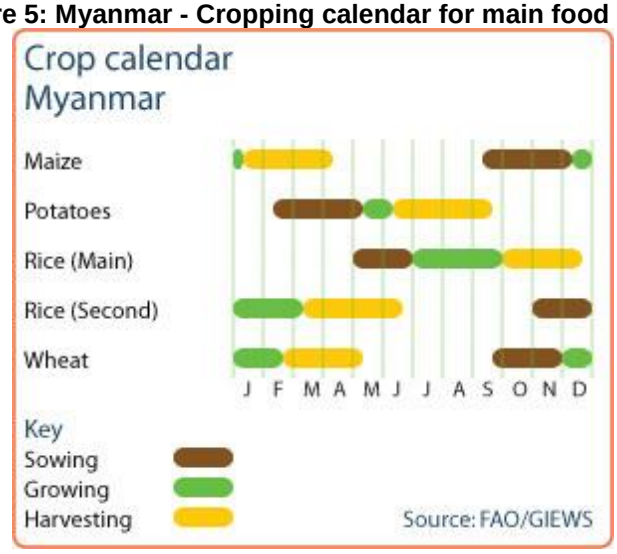
Source: Practitioners' and policy makers' exchange on climate change adaptation in agriculture, Myanmar (2010). Cited on ICRISAT website.

An estimated 19.2 percent of the country's total land surface is classified as agricultural land, of which 86 percent is arable, 11 percent is under permanent crops, and 3 percent is under permanent pasture. Forests cover 48.2 percent of the country.

3.2 Food production

Rice is the country's main crop and staple food. Other major crops include maize, pulses, oilseeds, sugarcane, rubber, tea and timber. Figure 5 shows the cropping calendar for the country's main food crops.

Figure 5: Myanmar - Cropping calendar for main food crops



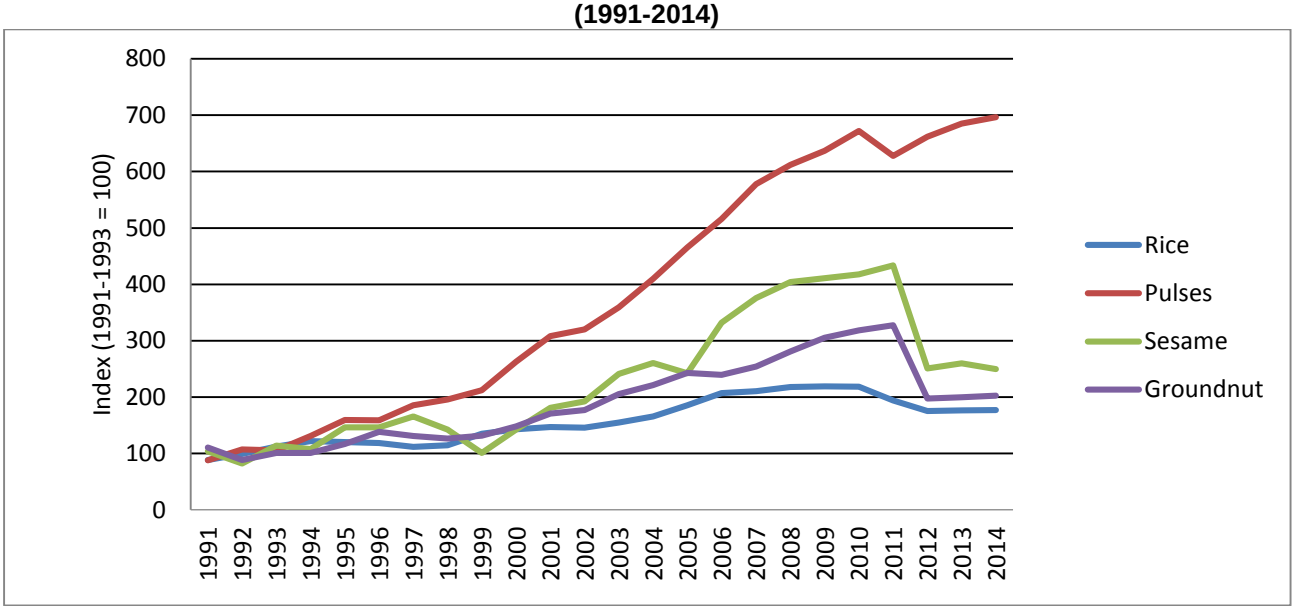
Source: FAO/GIEWS.

Over the past six decades, and up to as recently as two years ago, the Government measures have sought to make rice, considered to be a strategic crop, available at affordable prices. To pursue this policy, rice exports were controlled through the issuance of export licences, and farmers were required to sell their rice at low prices to the domestic milling industry. The low prices benefited consumers, but penalized farmers. To ensure that the lower incentives did not adversely affect rice production, farmers were allocated production quotas and benefitted from lower land taxes compared with those who grew other crops, such as pulses or beans. This led to an increase in the area planted with rice and a consequent increase in production. The rice-cultivated areas increased by more than 20 percent between 1994 and 2014 (from 5.9 million hectares to 7.2 million hectares), and production increased by 37 percent, reaching 28.2 million tonnes in 2014. Improved extension services, and an increase in the use of high-yielding varieties and fertilizers, also supported rice production growth.

The sale of pulses, including black gram, green gram and pigeon pea, was liberalized in 1988, since they were not considered strategic crops. As a result of the liberalization, production growth of pulses was more pronounced than for rice with the output almost quadrupled between 1991 and 2014 (Figure 6). The liberalization of this sector resulted in pulses becoming the second largest recorded export earner of the country, after oil and gas. Similarly, the area planted to sesame and groundnut increased by 20 and 86 percent respectively during the last two decades and production of both crops tripled over the same period[2].

[2] The apparent decrease in the production of all crops in 2011-2012 is the result of a change in the statistical methodology leading to a downward revision of agricultural production by the Government and does not necessarily indicate a decrease in actual production. This should be taken into account when considering the above statements concerning the expansion of production.

Figure 6: Myanmar - Relative trends in production of rice, pulses, sesame and groundnut (1991-2014)



Source: Department of Planning, MoAI.
Note: The apparent decrease in the production of all crops in 2011-2012 is the result of a change in the statistical methodology leading to a downward revision of agricultural production by the Government and does not necessarily indicate a decrease in actual production.

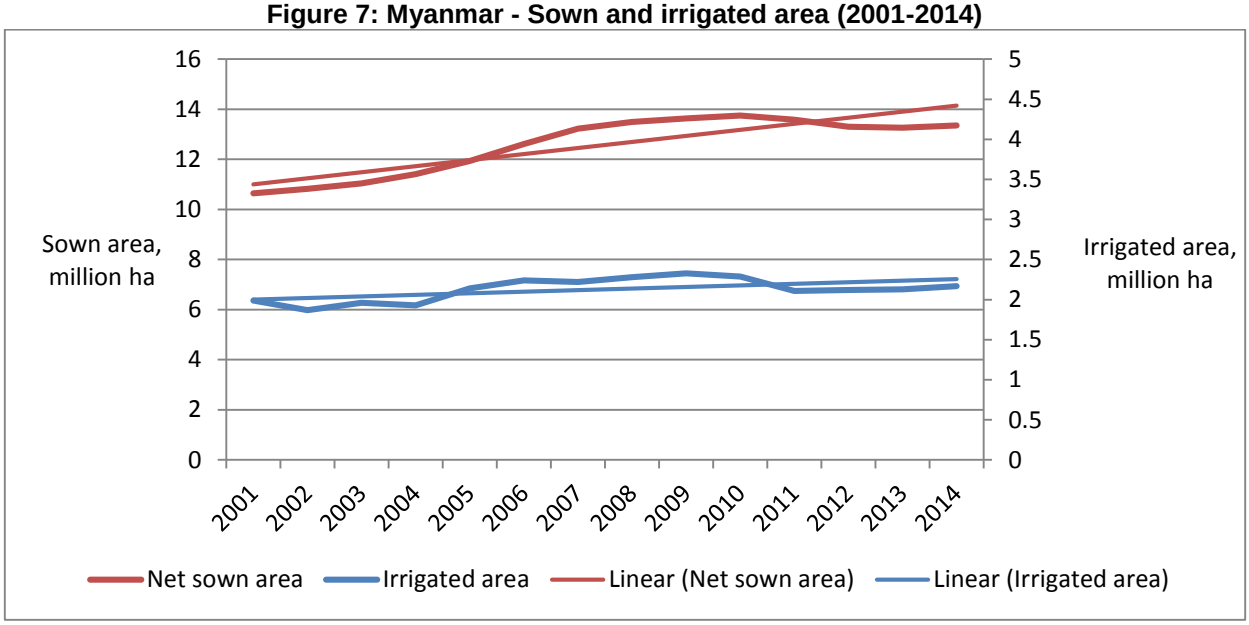
Paddy can be grown twice a year in areas where irrigation is available. The monsoon (rainfed) crop is far more important in terms of area than the irrigated secondary (summer) crop. Nevertheless, secondary (summer) crop yields are usually higher than those of the monsoon crop because of better soil-moisture control under irrigation. Overall, about 85 percent of the annual paddy production is grown during the *monsoon* and 15 percent during the secondary *summer* season. Paddy is mostly transplanted in both seasons. Average paddy yields in Myanmar (generally between 3.8 and 4.7 tonne/ha) are similar to those achieved in Thailand but are significantly lower than in Viet Nam (5.8 tonne/ha) and China (6.9 tonne/ha).

Farm sizes are small, averaging 3-4 acres (1.2-1.6 hectares), and a farmer's holdings are not always contiguous. Farm mechanization is increasing, but slowly, with still only a relatively small number of tractors and combine harvesters available for farmers to hire. Most farmers still depend on animal draught and manual labour for their farm operations, but increasing numbers are investing in power-tillers. Fertilizer use is low and often limited to urea, and most farmers (66 percent) use home-produced seed, which is often of poor quality, retained from the previous season's harvest.

3.3 Irrigation

The country's total renewable water resource is estimated at 1 168 km^3 but only a small proportion of this is used for irrigation. In 2015 the MoAI estimated that 2.17 million hectares (or 16.2 percent of the cropped area) were irrigated from dams and pumping stations. This figure, however, is increasing, as new dams, tube wells and pumping stations are built. Before 1988 only 540 752 hectares were irrigated from dams; by 2015 that figure had grown to 1.2 million hectares (Figure 7).

Figure 7: Myanmar - Sown and irrigated area (2001-2014)



Source: MoAI. Myanmar Agriculture in Brief (2015).

Of the 2.17 million hectares currently irrigated, approximately 215 000 hectares are served by pumped systems (from rivers and tube wells) while the remaining 1.96 million hectares are served by dams.

There is room to improve irrigation efficiency, which is currently estimated at about 25 percent, according to MoAI. The Irrigation Department is responsible for the design, construction and maintenance of irrigation canals and other structures down to tertiary level. Water management along the tertiary canals is the mainly under the responsibility of informal Water Users' Groups, incorporating Village Water Committees. With the often scattered nature of farmers' irrigated fields and the currently inadequate system for collection, most farmers do not pay water taxes. Overall, the national policy, strategy and institutional framework that defines the rights, responsibilities and obligations of irrigation users, needs to be strengthened, to support increasing efficiency.

3.4 Slash-and-burn cultivation

In isolated mountainous areas such as Chin State, slash-and-burn cultivation is still prevalent. The productivity from this type of agriculture is reported to be declining as a result of diminishing periods between cultivations and the consequent incomplete recovery of soil fertility. In the past, farmers would leave land follow for around 15 years; now, with increased population pressure on land, this interval between cultivations has generally diminished to six or seven years.

3.5 Fishing

Fish farming has grown increasingly important in recent years and is becoming a major export industry.

3.6 Land policy

Until 2012 all land belonged to the state. Under the policy of state ownership, farmers were given the right to cultivate the land but they could not sell, divide or mortgage it. Land use rights (and occupancy right) were legally inheritable so would pass from one generation to the next. Absentee land ownership was illegal, and if holding was abandoned for any reason, the Land Committee had the right to transfer it to landless farmers. This policy was abandoned, when the Farm Land Law was passed in March 2012. Under this law, existing farmers are, in theory, allowed to mortgage, rent, and exchange or sell their land. There remains, however, numerous bureaucratic procedures that complicate the selling and buying of land, and it would appear that few farmers have actually been able to take advantage of the new law. The Vacant, Fallow and Virgin Land Management Law, passed at the same time as the Farm Land Law, allows national companies, private investors and others to utilize vacant, fallow and virgin land for agricultural and livestock projects. At the moment, 381 private companies have been granted 0.96 million hectares for commercial farming.

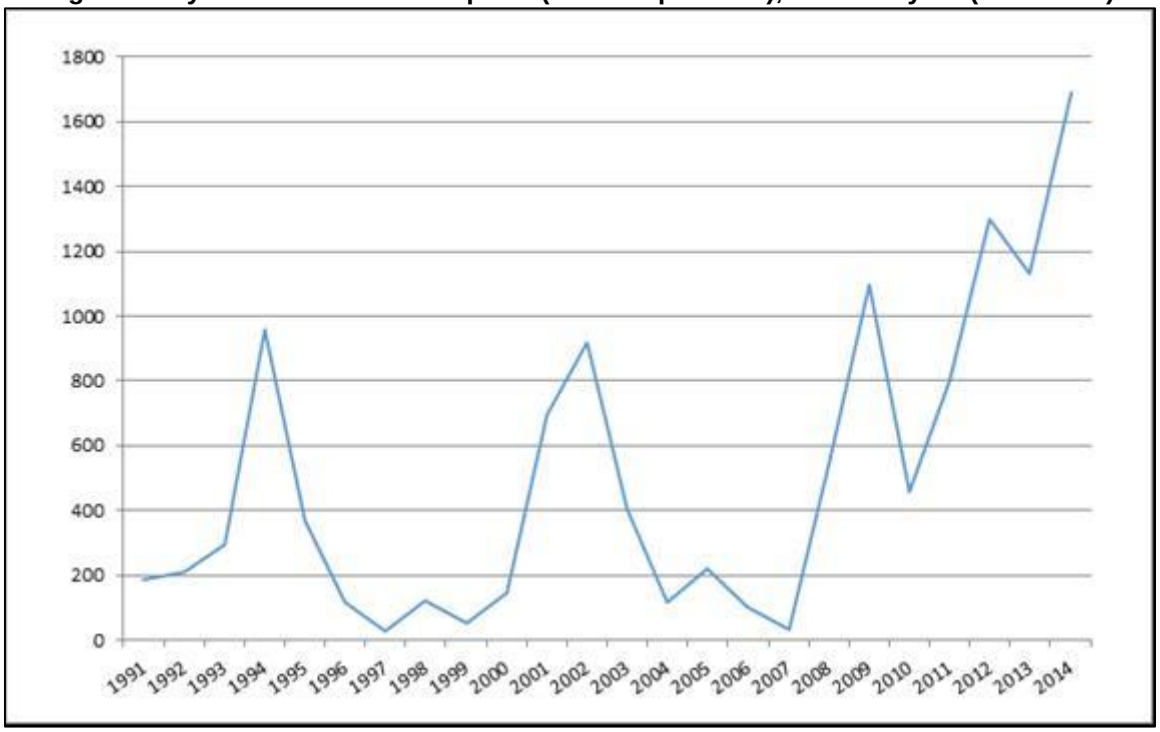
3.7 Credit policy

The Myanmar Agricultural Development Bank (MADB) is a state-owned agency providing credit to rural communities. In 2011, the loan size per acre was MMK 40,000, and in 2012 it was MMK 50,000. Since 2010, the MADB has increased the loan size per acre from MMK 20,000 to MMK 100,000 in 2014, enabling farmers to take out a maximum loan of MMK 1,000,000 for 10 acres. Collateral to obtain credit is often assessed on a community basis, and in such cases the whole community can suffer financially as a result of default by one of its members. Those with no collateral are especially disadvantaged.

3.8 Rice exports

After a relatively volatile period between 1991 and 2004 (see Figure 8), rice exports have shown an overall increasing trend since 2007, with rice shipments estimated to have increased from around 200 000 tonnes to 1.7 million tonnes between 2004 and 2014, largely due to sharply increased sales to China. Seaborne deliveries of rice are estimated to have reached 0.6 million tonnes in 2014, most of it low quality rice shipped to Africa, roughly twice this amount is exported through borders, primarily to China, Thailand and Bangladesh. In addition to these recorded exports, large volumes of unrecorded cross-border exports are assumed, but a precise estimate of the amounts involved is not available.

Figure 8: Myanmar – Total rice exports (milled equivalent), calendar year (1991-2014)



Source: FAOSTAT (1991-1999), FAO estimate (2000-2012), Central Statistical Organization, Ministry of National Planning and Economic Development (2013-2014).

4. FOOD PRODUCTION AND AVAILABILITY

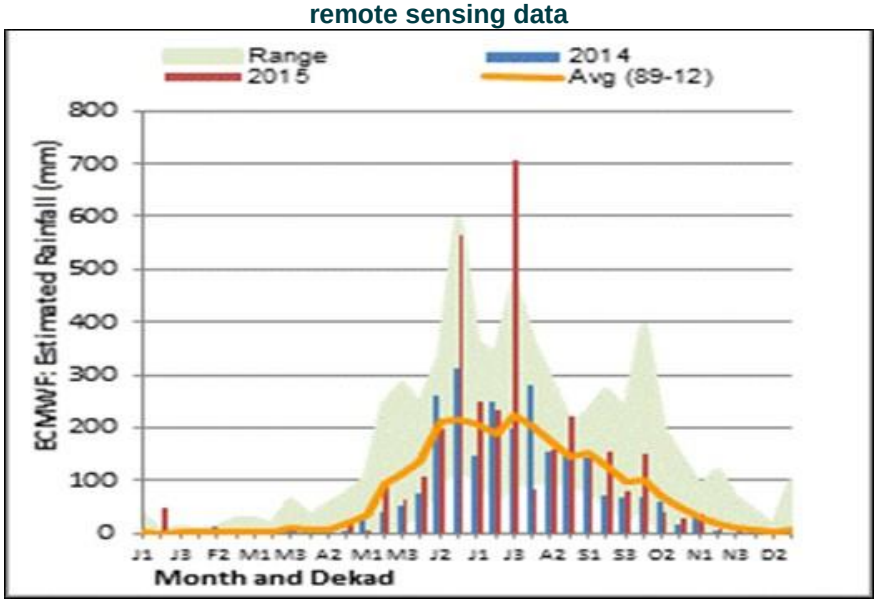
4.1 Factors affecting cereal crop production in 2015

4.1.1 *Rainfall*

The onset of the 2015 monsoon rains was normal in most parts of the country although some parts of Magwe, Kayin, Ayeyarwaddy and Bago West reported a delay of 10 to 14 days. The rains increased significantly in late June and July, and further intensified due to the passing of Cyclone Komen which made landfall on 30 July. Total rainfall amounts in July and early August reached record levels in several locations. The heavy rains caused severe localized flooding in 12 of the country's 15 states/regions. Large tracts of agricultural land were inundated, especially in Ayeyarwaddy, parts of Bago, Sagaing, Rakhine, Chin, Yangon and Magwe. According to the National Natural Disaster Management Committee, 487 550 houses were damaged and 38 951 houses destroyed by floods. Rainfall amounts following Cyclone Komen were not significantly different to the long-term average, but they were sufficient to delay the subsidence of floods in some areas. Flooding persisted into September in some parts of Ayeyarwaddy and Rakhine. However,

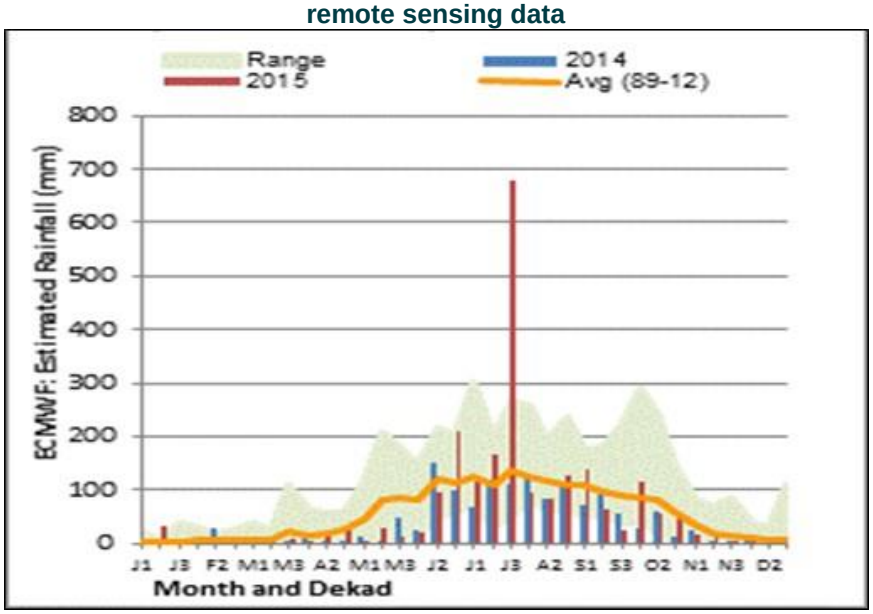
Kayah State and Mandalay Region experienced well below-average rains between May 2015 and November 2015. Figures 9 and 10 show the decadal precipitation for the period January 2014 to December 2015 in two of the most flood-affected states, compared with the long-term average (23 years).

Figure 9: Myanmar (Rakhine State) - Estimated rainfall derived from remote sensing data



Source: FAO/GIEWS Earth Observation Tool.

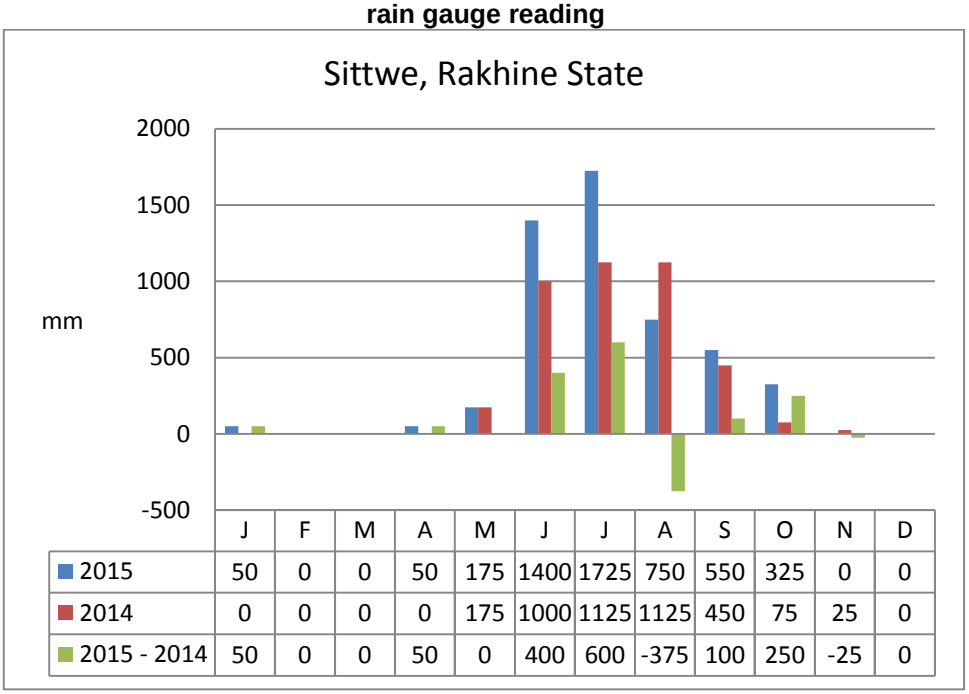
Figure 10: Myanmar (Chin State) - Estimated rainfall derived from remote sensing data



Source: FAO/GIEWS Earth Observation Tool.

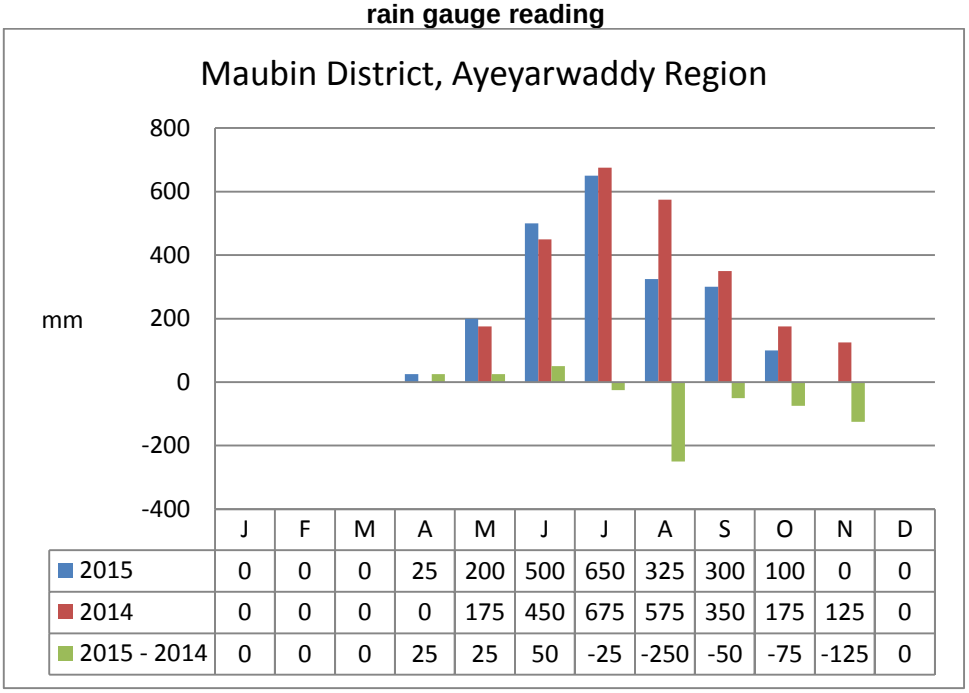
Although most flooded areas, such as Sittwe in Rakhine State (Figure 9), received unusually high amounts of seasonal rainfall (1 050 mm more than in 2014), this was not always the sole cause of flooding. For instance, Maubin District in Ayeyarwaddy Region received 425 mm less rain in 2015 than in 2014, but extensive flooding was caused by the high intensity of individual rainfall episodes. (Figure 11 and 12).

Figure 11: Myanmar (Sittwe, Rakhine State) - Monthly rainfall as recorded by rain gauge reading



	J	F	M	A	M	J	J	A	S	O	N	D
2015	50	0	0	50	175	1400	1725	750	550	325	0	0
2014	0	0	0	0	175	1000	1125	1125	450	75	25	0
2015 - 2014	50	0	0	50	0	400	600	-375	100	250	-25	0

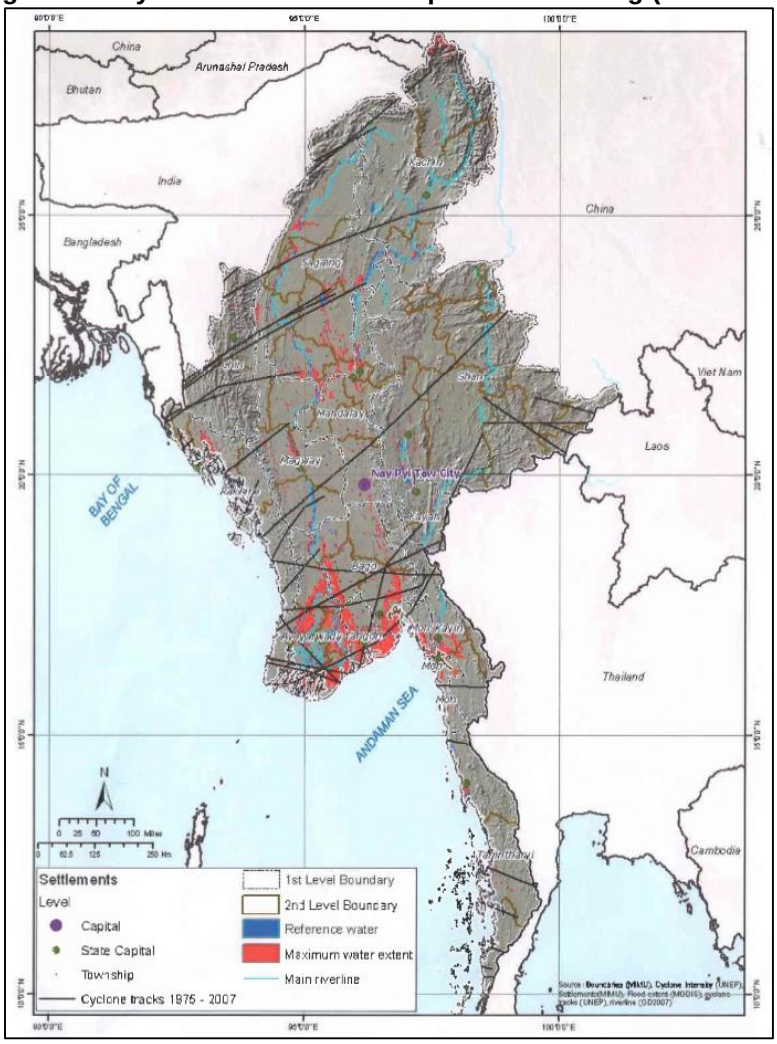
Figure 12: Myanmar (Maubin, Ayeyarwaddy) - Monthly rainfall as recorded by rain gauge reading



	J	F	M	A	M	J	J	A	S	O	N	D
2015	0	0	0	25	200	500	650	325	300	100	0	0
2014	0	0	0	0	175	450	675	575	350	175	125	0
2015 - 2014	0	0	0	25	25	50	-25	-250	-50	-75	-125	0

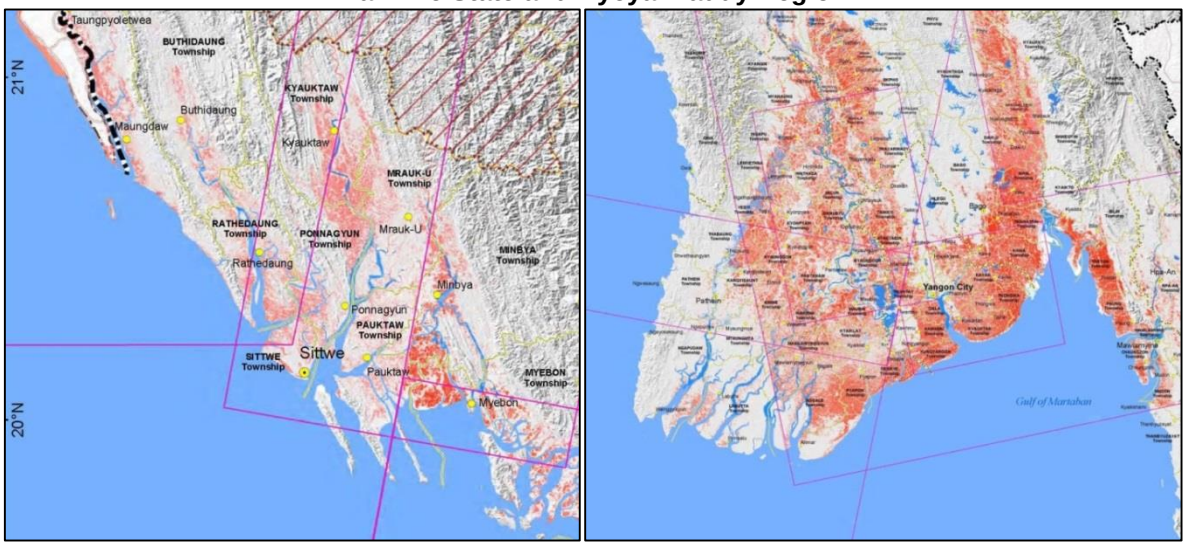
Although Cyclone Komen caused extensive damage, it was not an unprecedented event. Much of Myanmar, and especially its rice-producing area, is prone to extensive flooding. Of the total 2.89 million hectares of rice area in the Ayeyarwaddy Delta (which includes Ayeyarwaddy, Bago and Yangon Regions) 371 880 hectares (about 13 percent) are classified as flood-prone, 22 416 hectares as salt-affected and 64 941 hectares as drought-prone (MoAI 2015 Myanmar Rice Sector Development Strategy). On account of its vulnerability to a wide range of natural hazards, including floods, cyclones, earthquakes, landslides and tsunamis, Myanmar is classified, according to the UN Risk Model, as the 'most-at-risk' country in the Asia-Pacific region (OCHA 2012). Figure 13 illustrates the country's vulnerability to flood damage in the context of the recent past.

Figure 13: Myanmar - The extent of periodic flooding (2000-2011)



Source: MODIS.

Figure 14: Myanmar - Flooding resulting from Cyclone Komen, Rakhine State and Ayeyarwaddy Region



Source: MIMU. Based on satellite images generated between 10 July and 17 August 2015.
Flooded areas shown in red

4.1.2 *Fertilizers*

The use of fertilizers is widespread but application rates in the field frequently differ from those recommended by the DoA. Recommendations typically include urea, triple super phosphate (TSP), potash (KCl) and a compound fertilizer (15.15.15 or 15.15.10 or 15.15.6). However, many of those farmers who do use fertilizer often decide to use only urea, for two main reasons: first, the effects of urea on the crop are visible within a few days of application; and second, urea is cheaper than the other recommended fertilizers. While in the field, the Mission observed a lot of lodging (fall over) of paddy that had not yet been harvested. The application of only urea without the balancing effects of TSP and KCl may have contributed to the observed excessive lodging.

Fertilizer prices rose during the year in 2015, partly reflecting the devaluation of the MMK. Typically a 50 kg bag of urea that cost MMK 17,000 in 2014, was retailing for between MMK 20,000 and MMK 22,000 in 2015. A 50 kg bag of TSP costs about MMK 24,000 depending on location, KCl about MMK 36,000 and compound fertilizer from MMK 30,000 to MMK 50,000. Myanmar produces urea but not in sufficient quantities to satisfy national demand. Table 2 shows the amounts produced between 2010/11 and 2013/14. All other fertilizers, in addition to extra urea, are imported.

Table 2: Myanmar - National production of urea

Year	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Production (tonnes)	35 000	166 000	209 000	157 000

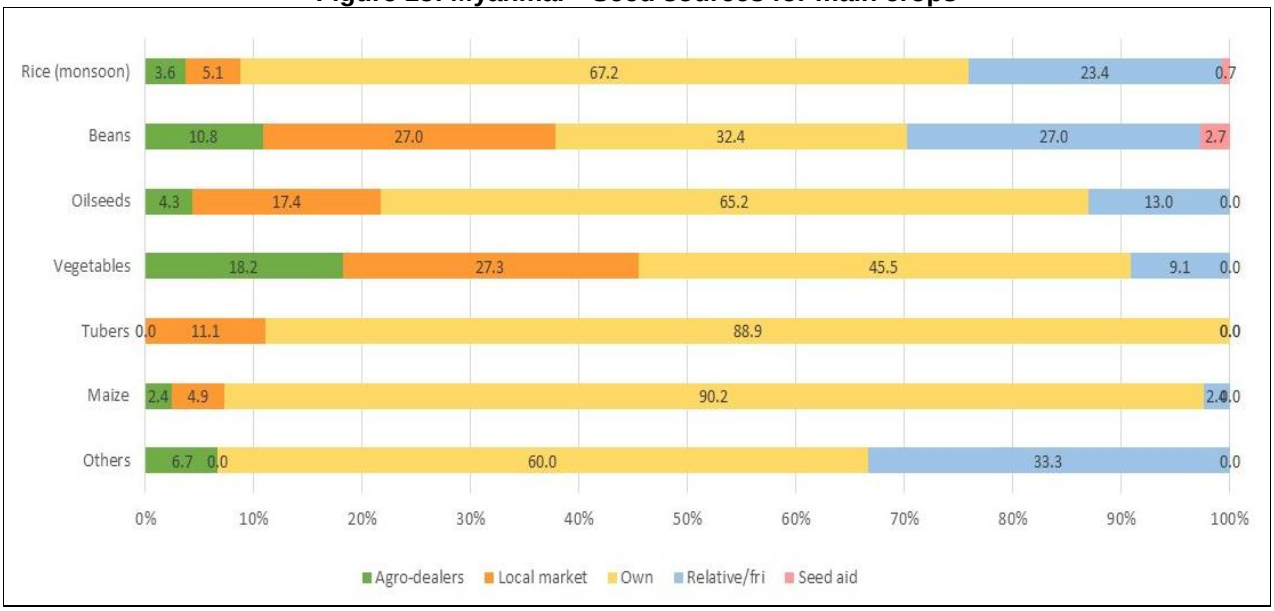
Source: MoAI (2014). Myanmar Agriculture at a Glance.

Farmers often apply farmyard manure to their fields when it is available, but it is generally in short supply. Typically a farm household would keep only one pair of draught animals, and, with increasing mechanization, many have none.

4.1.3 *Seeds*

During the Mission households were asked about the sources of seed used for planting in the 2015 monsoon season. Taking all cultivated crops together, 66 percent of the seeds were from farmer's own saved seed, with 19 percent being sourced from friends or relatives, 8 percent from the local market, 5 percent from agro-dealers and only 1 percent from seed aid. Depending on the crop (see Figure 15), there are significant variations in the proportions of seed obtained from different sources. In all cases, own saved seed is the most popular source, although the actual proportion of own saved seed varied from 90 percent in the case of maize to just 32 percent in the case of beans. It is striking that the role of the formal seed sector – as represented by agro-dealers – was minor for most crops, the highest proportion being 18 percent for vegetables. The relatively minor importance of the formal sector in farmer seed security is due to both lack of seed being available and very high costs of seed. (See Annex with more detailed information of the survey).

Figure 15: Myanmar - Seed sources for main crops



Source: Data compiled by FAO from the Household Survey undertaken by the WFP Myanmar Country Office.

Seed aid accounted for a rather low proportion of total seed, varying from less than 1 percent for some crops to about 10 percent for maize and just under 8 percent for rice. Most of the free seed was distributed by the Government, with smaller amounts coming from NGOs. As shown in Figure 31a (in Annex of the report), with the exception of cassava and taro, there were shortages of seed before the monsoon floods of 2015. Between 14 percent of respondents (maize) and 32.5 percent of respondents (beans) reported that they had insufficient seed to plant their available planting area. The largest proportion of households (over 60 percent) reporting shortages was in relation to minor crops (mainly potatoes) - indicated in the Figure as "other".

4.1.4 *Labour*

In most regions/states apart from Shan, the Mission was informed of a general shortage of farm labour. Although agricultural labour wages have typically increased by 30-50 percent compared with 2014 level to MMK 4,000 to MMK 5,500 per day for men and MMK 3,000 to MMK 4,500 per day for women – it is unclear whether they have kept pace with food inflation. Consequently there has been extensive movement of labour away from farms to urban areas or migration to other countries. However, there are reports of labourers returning to the agriculture sector during periods of intense farm activity. A substantial number also seek employment in neighbouring countries, which negatively impacts farm labour supplies and crop productivity.

4.1.5 *Farm power*

The mechanization of farm operations, such as land preparation, planting, transplanting and harvesting, greatly facilitates their timeliness. This is especially important given Myanmar's crop calendars that involve planting as soon as possible after the harvest of the previous crop. Protracted manual harvesting can delay the planting of the following crop, or the farmer may decide to leave the harvested crop in the field, where it is subject to damage and loss prior to threshing, while he plants the following crop. The latter scenario was observed this year in many parts of the country.

The use of farm machinery has increased slowly in recent years, but figures from the MoAI (Table 3) indicate that the pace of mechanization may now be accelerating. For instance, the number of combine harvesters in the country more than doubled between 2013/14 and 2014/15. Nevertheless, the use of combine harvesters in Myanmar remains well below that of neighbouring countries.

Table 3: Myanmar - Farm machinery in Myanmar, 2013/14 and 2014/15

	2013/14	**2014/15**
Tractor	11 839	14 265
Mini-tractor	1 506	2 113
Power-tiller	257 971	286 097
Cultivation roller	5 403	6 065
Thresher	55 104	61 793
Combine harvester	668	1 680
Trans planter	122	169

Source: MoAI (2015). Myanmar Agriculture in Brief.

Constraints to further mechanization are twofold. For those farmers who consider purchasing their own equipment, the price can be prohibitive; and for those who depend on hiring a contractor to carry out operations for them, the limited number of machines available to large numbers of farmers inevitably results in delays for most. A new power-tiller costs between MMK 1.6 million and MMK 2.5 million depending on its provenance. Thai-manufactured ones are the most expensive and those on sale from the Agricultural Mechanization Department are the cheapest. Chinese-manufactured machines cost about MMK 2 million.

Mechanized land preparation for paddy, which involves one pass by a tractor and plough and two passes by power-tiller, and usually costs approximately MMK 70,000 per acre (0.4 hectare). Combine harvesting of one acre costs between MMK 40,000 and MMK 45,000 and takes approximately one hour. The cost was found to be fairly uniform in all regions/states visited by the Mission. Threshing generally costs between MMK 150 and MMK 200 per basket for paddy (21 kg) and between MMK 400 and MMK 500 for black grams and green grams.

Townships generally reported that this year's floods had not caused any serious damage to farm machinery. However, large livestock losses particularly in the Rakhine is expected to reduce availability of farm power at household level resulting in the need to spend more resources for animal power or machinery rental in the upcoming agricultural season.

4.1.6 *Crop pests and diseases*

Levels of most crop pests and diseases were normal during the 2015 monsoon season, inflicting minimal damage on cereal crops. An exception was the elevated incidence of leaf case worm (*Nymphula depunctalis*) in Mandalay, Kachin and Shan, presumably exacerbated by the abnormally extensive areas of standing water, which favour the pest's proliferation. Farmers were, however, successfully instructed by the DoA to control the outbreak using pesticides. Higher-than-normal levels of false smut (*Ustilaginoidea virens*) were reported in some areas this year. Spread of the pathogen, which can cause significant reduction in grain weight, is favoured by high humidity.

Armyworms are common in summer paddy fields in many parts of Myanmar but are usually successfully controlled by flooding or with pesticide.

5. CEREAL AREA, YIELD AND PRODUCTION IN 2015

5.1 Paddy

5.1.1 *Area planted*

The harvested area of paddy in the 2015 monsoon season is estimated at 6 million hectares, 3 percent below the 6.2 million hectares in 2014. The Mission's figure is based on the MoAI's estimates of the area originally planted, the level of damage to paddy land attributable to flooding in each region/state, and the area that was replanted (Table 4). The MoAI estimates were triangulated with field observations, interviews with farmers and other key informants in the field, and discussions with the Myanmar Rice Federation, and adjusted accordingly where necessary. One major adjustment that the Mission made to these figures following its triangulation was to the area replanted in Rakhine State; the MoAI's 99 percent of replanted areas was adjusted to 50 percent.

Table 4: Myanmar - 2015 Monsoon paddy area damage by flooding and the extent of replanting

State/ Region	Planted (ha)[1]/	Damaged (ha)	Replanted (ha)	Damaged (%)	Replanted (%)	Harvested area (ha)[2]/ in 2015	Harvested area (ha) in 2014	Change: 2015 over 2014 (%)
Union Territory (Naypyitaw)	67 603	0	0	0.0		67 603	66 238	2.1
Kachin	179 981	5 245	3 563	2.9	68	178 299	178 590	-0.2
Kayah	36 444	14	0	0.0	0	36 415	36 923	-1.4
Kayin	211 163	30	30	0.0	100	211 163	213 030	-0.9
Chin	36 054	1 505	151	4.2	10	34 700	37 260	-6.9
Sagaing	722 881	44 709	27 994	6.2	63	706 166	707 048	-0.1
Tanintharyi	102 373	0	0	0.0		102 373	102 695	-0.3
Bago	1 118 796	60 258	43 030	5.4	71	1 101 568	1 116 460	-1.3
Magway	319 677	3 278	2 994	1.0	91	319 110	321 510	-0.7
Mandalay	186 298	6	2	0.0	33	186 294	204 210	-8.8
Mon	278 133	0	0	0.0		278 133	279 818	-0.6
Rakhine	445 095	87 627	43 500	19.7	50	400 968	447 939	-10.5
Yangon	484 628	22 859	9 569	4.7	42	471 338	484 930	-2.8
Shan	527 437	1 016	190	0.2	19	526 611	531 895	-1.0
Ayeyarwaddy	1501 542	86 452	16 774	5.8	19	1431 864	1 485 403	-3.6
Total	**6 218 104**	**313 005**	**147 797**	**5.0**	**47**	**6 052 896**	**6 213 949**	**-2.6**

Source: MoAI. MoAI's figures were in acres. These have been converted to hectares. No figures on flood damage are available for Union Territory (Nay Pyi Taw).
1/ Prior to the floods.
2/ Harvested area including the replanted areas after the floods.

The 3 percent reduction in paddy area in the 2015 monsoon season compared with 2014 reflects the flood-damaged area that was not possible to replant, for several reasons: farmers reported that the land had been covered with sand and debris making it impossible to re-plant; flood subsidence were too late to justify re-planting with paddy, and farmers were unable to obtain or afford new seed.

5.1.2 *Paddy yield*

In order to assess paddy yields, the DoA selects sample fields purposively that represent upland, mid-level and lowland paddy production. Within each sample field, three square sample plots, each measuring 6.5 x 6.5 feet (approximately 2 x 2 m), are marked out. These plots are located on or near to a diagonal line running from one corner of the field to the opposite corner. The entire paddy crop in each sample plot is cut and left to dry for about 4 hours in the sun. It is then threshed manually and the grain is weighed. No direct assessment is made of the moisture content of the grain, but a reduction factor of 15 percent is applied to the recorded weight; this is considered to give a realistic weight of paddy at about 14 percent moisture, the grain-moisture content that is accepted by millers. This procedure is reportedly carried out on a large number of plots each year. The adjustment factor of 15 percent to arrive at mill-ready weight seems reasonable as it implies an assumed moisture content of just under 27 percent at the time of weighing in the field. Starting with that moisture content, a reduction of the field weight by 15 percent gives the weight at 14 percent moisture content.

At the time of the Mission's visit much of the paddy in the main rice-producing areas had already been harvested, but the DoA estimates of the yields of what remained as standing crop in the field appeared to the Mission to be broadly acceptable. For the 2015 monsoon season average paddy yields are estimated at 3.77 tonne/ha, marginally below the previous year's level. Production for the 2015 monsoon season is estimated at 22.8 million tonnes (see Table 5), 4 percent below the previous year's level and 3 percent lower than the average of the preceding three years. Area and yield reductions were mainly attributed to the flood damage, while the slight yield decrease in Kayah and Mandalay was the result of reduced rains throughout most of the season.

Table 5: Myanmar - Comparison between 2014 and 2015 monsoon season paddy area ('000 hectares), yield (tonnes/hectare) and production ('000 tonnes)

State/Region	Monsoon 2014			Monsoon 2015			Change 2015 over 2014 (%)		
	Planted	Yield	Production	Planted	Yield	Production	Area	Yield	Production
Union Territory (Naypyitaw)	66	4.5	298	68	4.49	303	2.1	-0.1	1.8
Kachin	179	3.5	618	178	3.52	627	-0.2	1.9	1.4
Kayah	37	3.4	131	36	3.30	120	-1.4	-2.9	-8.3
Kayin	213	3.6	771	211	3.62	764	-0.9	0.6	-0.9
Chin	37	2.4	89	35	2.20	76	-6.9	-6.8	-14.2
Sagaing	707	4.3	3 049	706	4.36	3 079	-0.1	1.4	1.0
Tanintharyi	103	3.6	372	102	3.62	371	-0.3	0.6	-0.4
Bago	1 116	4.0	4 431	1 102	3.95	4 351	-1.3	-0.3	-1.8
Magway	322	4.4	1 406	319	4.40	1 404	-0.7	0.7	-0.1
Mandalay	204	4.1	838	186	4.00	745	-8.8	-2.4	-11.1
Mon	280	3.4	956	278	3.43	954	-0.6	0.3	-0.2
Rakhine	448	3.5	1 569	401	3.30	1 323	-10.5	-5.7	-15.7
Yangon	485	3.5	1 710	471	3.45	1 626	-2.8	-1.9	-4.9
Shan	532	4.0	2 109	527	3.90	2 054	-1.0	-2.5	-2.6
Ayeyarwaddy	1 485	3.6	5 372	1 432	3.50	5 012	-3.6	-2.5	-6.7
Total	**6 214**	**3.80**	**23 718**	**6 053**	**3.77**	**22 810**	**-2.6**	**-0.8**	**-3.8**

Source: 2014 figures based on official estimates from MoAI; 2015 figures based on Mission estimates.

The impact of flooding on yield and area of monsoon paddy is briefly summarised for each state/region in Table 6.

Table 6: Myanmar - Effects of flooding on monsoon paddy area and yield in 2015 compared with 2014

State/Region	Consequences of flooding
Kachin	Area down marginally. Some loss of planted area to flooding, but very little. Ongoing political instability has also contributed to a small area reduction. Yields increased slightly due to better rainfall.
Kayah	Area decreased marginally and yields are also estimated to have decreased slightly due to well-below average rains throughout most of the growing season. (Not visited by the Mission.)
Kayin	Small paddy area cuts due to standing water in the fields for 2-3 weeks following floods. Transplanting was delayed by about two weeks due to late monsoon rains. Yields are estimated to have increased marginally, compensating for the small contraction in plantings. Increased mechanization, 50 percent of paddy is harvested by combine harvesters, led to higher yields this season.
Chin	Paddy planted area and yields were both reduced by floods. Increasing population pressure on the slash-and -burn cropping system that is widespread in Chin State, the average intervals between cultivations in the same field have decreased in recent decades from 15 to 7 years, with consequent declines in soil fertility and crop yield.
Sagaing	Most of the flooded area has been replanted. Harvested paddy area in 2015 remained similar to the harvested area in 2014, while yield increased marginally because of better rainfall. The region produces high-quality rice.
Tanintharyi	A marginal increase in yields according to MoAI. (Not visited by the Mission.)
Bago	Paddy area and yield in Bago East were both reduced slightly by floods. This was partly offset by a slight increase in yield in Bago West as a result of better rainfall.
Magway	Paddy area reduced as floods damaged nurseries. A slight increase in yields on account of better water conditions is expected to largely compensate for the area cuts. The DoA wishes to increase the area of summer paddy but will probably be constrained by the limited amount of available irrigation water.
Mandalay	The area under monsoon paddy decreased, mainly because farmers, aware of climate change and increasingly unreliable rainfall in the central dry zone, are switching to other crops. Yield are also expected to decrease slightly due to well below-average rains throughout most of the season, although better water irrigation summplies in some areas offset possible further yield decreases.
Mon	No change reported. (Not visited by the Mission.)
Rakhine	20 percent of the state's paddy fields were damaged by floods; of these, 50 percent were replanted, but not all is expected to be harvestable. (Official DoA figures suggest that 99 percent of the flood-damaged area was replanted but this does not tally with Mission observations, farmer interviews or the estimate of the Myanmar Rice Federation.) Some of the replanted paddy, having been replanted late in the season, is likely to give low yields.
Yangon	Despite extensive replanting of paddy following flood damage, there were some reduction in harvested area and a slight yield reduction.
Shan	Slight area reduction and a small decrease in yields from flood damage.
Ayeyarwaddy	Extensive flooding occasioned up to two re-plantings. By September many farmers replanted with black gram, cowpea or maize instead of paddy. Paddy area and yield both reduced.
Union Territory	A slight increase in area planted. Yields unchanged. No change reported. (Not visited by the Mission.)

5.1.3 *Paddy production in 2015*

Assuming that the area planted to the 2015 secondary (*summer*) season (currently in the ground) returns closer to average, after last year's reduced level in response to weak domestic prices, the output of the 2015 secondary crop is projected to increase by 5 percent year-on-year to 4.7 million tonnes (see Table 7). In aggregate, production of paddy in 2015 (2015 monsoon and ongoing 2015 secondary season) is forecast by the Mission at 27.5 million tonnes, which is 3 percent lower than the previous year's output of 28.2 million tonnes and 2 percent lower than the three-year average of 28.1 million tonnes.

Table 7: Myanmar – 2015 paddy area ('000 hectares), yield (tonnes/hectare) and production ('000 tonnes)

State/ Region	Monsoon 2015			Secondary 2015[1/]			Total		
	Planted	Yield	Production	Planted	Yield[2/]	Production	Planted	Yield	Production
Union Territory (Naypyitaw)	68	4.49	303	7	5.20	35	74	4.84	295
Kachin	178	3.52	627	2	3.25	6	180	3.38	633
Kayah	36	3.30	120	3	4.50	14	39	3.90	134
Kayin	211	3.62	764	51	3.90	198	262	3.76	962
Chin	35	2.20	76	0	4.10	0	35	3.15	76
Sagaing	706	4.36	3 079	102	4.80	490	808	4.58	3 568
Tanintharyi	102	3.62	371	4	3.57	15	107	3.60	386
Bago	1 102	3.95	4 351	100	4.30	430	1 202	4.13	4 781
Magway	319	4.40	1 404	30	5.10	153	349	4.75	1 557
Mandalay	186	4.00	745	71	5.20	372	258	4.60	1 117
Mon	278	3.43	954	10	4.00	40	288	3.72	994
Rakhine	401	3.30	1 323	9	4.20	39	410	3.75	1 362
Yangon	471	3.45	1 626	75	4.30	323	546	3.88	1 949
Shan	527	3.90	2 054	15	5.10	77	542	4.50	2 130
Ayeyarwaddy	1 432	3.50	5 012	520	4.80	2 496	1 952	4.15	7 508
Total	**6 053**	**3.77**	**22 810**	**1 000**	**4.68**	**4 678**	**7 052**	**4.22**	**27 487**

Source: Mission estimates (2015).
1/ The 2015 secondary season yields and production is an estimate by CFSAM, while planting estimated were provided by MAOI and adjusted when necessary.
2/ CFSAM estimates assuming average yields.

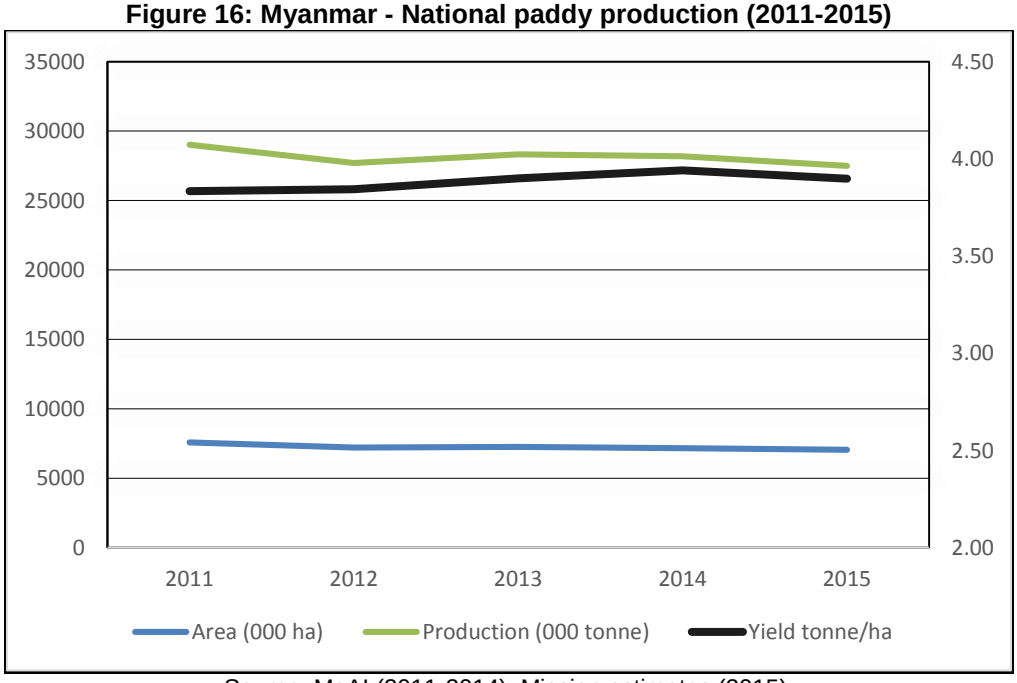
Tables 8 and Figure 16 show the 2015 national paddy production parameters in relation to the previous five years.

Table 8: Myanmar - National paddy production parameters (2011-2015)

	2011	2012	2013	2014	2015
Area ('000 ha)	7 567	7 208	7 264	7 152	7 052
Yield (tonnes/ha)	3.83	3.84	3.90	3.94	3.90
Production ('000 tonnes)	29 010	27 704	28 322	28 193	27 487

Note: Data refer to marketing year (October/September) and include the main and secondary season.
Source: MoAI (2011-2014); Mission estimates (2015).

Figure 16: Myanmar - National paddy production (2011-2015)



Source: MoAI (2011-2014); Mission estimates (2015).

Table 9 shows aggregate paddy production by state/region in 2015 compared with that of 2014. Significant reductions (>10 percent) are evident in Chin and Rakhine as well as Ayeyarwaddy (>5 percent).

Table 9: Myanmar – Rice production by state/region in 2014 and 2015

State/Region	2014	2015	2015 over 2014 (% change)
Union Territory (Naypyitaw)	333	295	-11.4
Kachin	624	633	1.4
Kayah	139	134	-4.1
Kayin	959	962	0.3
Chin	89	76	-14.2
Sagaing	3 389	3 568	5.3
Tanintharyi	386	386	-0.1
Bago	4 897	4 781	-2.4
Magway	1 556	1 557	0.0
Mandalay	1 049	1 117	6.5
Mon	1 004	994	-1.0
Rakhine	1 597	1 362	-14.7
Yangon	2 034	1 949	-4.2
Shan	2 199	2 130	-3.1
Ayeyarwaddy	7 937	7 508	-5.4
Total	**28 193**	**27 487**	**-2.5**

Source: MoAI (2014), Mission estimates (2015).

5.2 Maize

Nationally, maize is a minor crop, but in some remote areas, such as in parts of Chin and Shan States, it is the main staple food. Most of the country's maize however is used as livestock feed. Table 10 indicates the impact of the 2015 floods on maize production in the country's states/regions, and Table 11 shows the Mission's production estimates based on MoAI's reports and triangulation with information from discussions with farmers and others. National production is estimated at 1.267 million tonnes, with an average yield of 2.9 tonnes/ha. As illustrated in Table 12 and Figure 17, the decline in 2015 is mostly on account of reduced yields, with only a minor contraction in plantings estimated. Table 13 shows the national area, yield and production levels in 2015 compared with 2014 estimates and with the average of the previous five years.

Table 10: Myanmar – Impact of floods on maize area and yield, 2015 compared with 2014

State/Region	Consequences of flooding
Kachin	Minimal change
Kayah	Minimal change
Kayin	Minimal change
Chin	Area similar, yield down
Sagaing	Production down
Tanintharyi	Minimal change
Bago (East)	Minimal change
Magwe	Area reduced
Mandalay	Minimal change
Mon	Minimal change
Rakhine	Minimal change (very small amounts produced)
Yangon	Minimal change (very small amounts produced)
Shan	Area down by 8 percent. Yield down
Ayeyarwaddy	Area down. Yield similar
Union Territory	Minimal change

Table 11: Myanmar - Maize production by state/region (2015)

State/Region	Area ('000 hectares)	Yield (tonnes/ha)	Production ('000 tonnes)
Kachin	20	2.9	58
Kayah	13	3.4	44
Kayin	21	4.5	95
Chin	24	1.5	36
Sagaing	80	2.4	192
Tanintharyi	0.1	1.3	0.1
Bago (East)	3	3.4	10
Magwe	35	2.9	102
Mandalay	13	3.2	42
Mon	0	0	0
Rakhine	0.02	2.8	0.1
Yangon	0.07	2.0	0.1
Shan	207	3.0	621
Ayeyarwaddy	9	4.3	39
Union Territory	7	4.2	29
Total	**432**	**2.9**	**1 267**

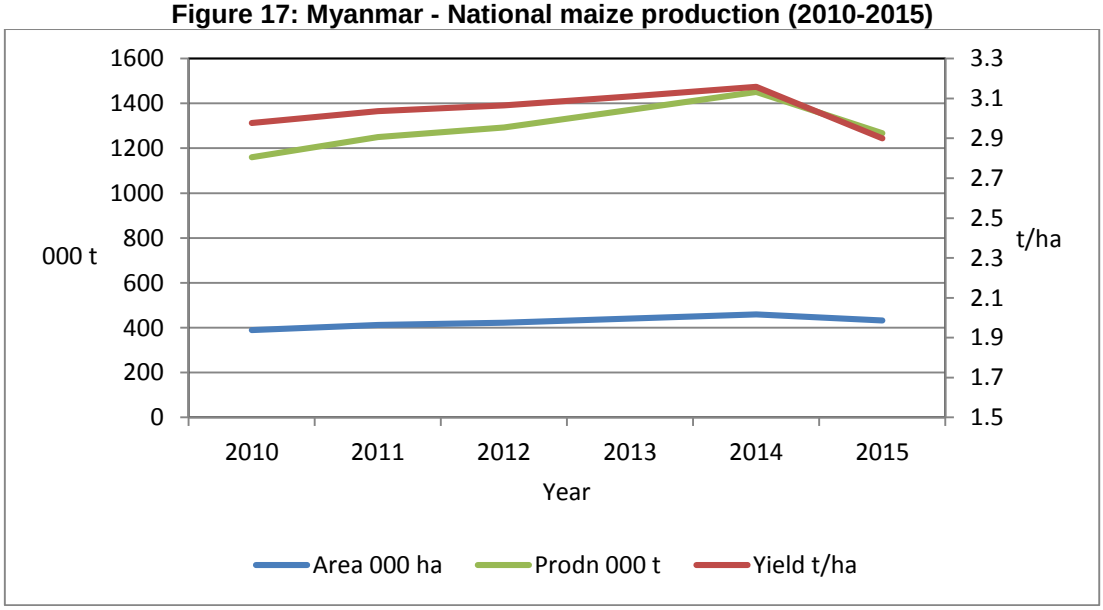
Source: Mission estimates (2015).

Table 12: Myanmar - Maize production parameters (2010-2015)

	2010	2011	2012	2013	2014	2015	Change 2015 over 2014 (%)
Area ('000 ha)	390	412	422	441	459	432	-6
Yield (tonnes/ha)	3.0	3.0	3.1	3.1	3.2	2.9	-9
Production ('000 tonnes)	1 159	1 251	1 293	1 371	1 451	1 267	-13

Source: MoAI (2010-2014), Mission estimates (2015).

Figure 17: Myanmar - National maize production (2010-2015)



Source: MoAI (2010-2014), Mission estimates (2015).

Table 13: Myanmar - Comparison of 2015 and 2014 national maize production with that of recent years

	2014	2015	Change 2015 over 2014 (%)	Five-year average (2010-2014)	Change 2015 over the five-year average (%)
Area ('000 ha)	459	432	-6	425	+2
Yield (tonnes/ha)	3.2	2.9	-9	3.1	-6
Production ('000 tonnes)	1 451	1 267	-13	1 305	-3

Source: MoAI (2014), Mission estimates (2015).

5.3 Wheat

Wheat, which represents only a small proportion of Myanmar's cereal production, is primarily grown at a subsistence level in Sagaing and Mandalay Regions and Shan State using seed retained from the previous harvest. These regions have limited rainfall, so yields are low at around 1.8 tonne/ha. National wheat production, estimated at 200 000 tonnes, is similar to 2014's above-average output. Wheat production in Myanmar is small due to the limited area that is suitable for its cultivation and the lower financial returns compared with other competing crops such as rice, beans, lentils and maize.

5.4 Other crops

The country's main pulse crops include black gram, green gram, pigeon pea, soybean, butterbean, cowpea and kidney bean. The area under pulses has increased by more than 40 percent since 2001 and now stands at approximately 4.55 million hectares. In many areas that were flooded in 2015, the sowing of black gram and green gram, both winter crops that often depend largely on residual soil moisture, was delayed by the re-planting and therefore late harvesting of the preceding crop of monsoon paddy. On the other hand, where farmers considered that it was too late to re-plant paddy following flood damage, grams were planted on time or sometimes slightly earlier than usual. Overall, production is expected to be slightly below average in 2015.

Black gram is mainly an export crop with a significant and growing market in India. High demand in 2015 has seen prices more than double from about MMK 30,000 to as high as MMK 73,000 per basket. Yields of black gram and green gram are usually more than 1 tonne/ha depending on soil type and the availability of supplementary irrigation. Yellow mosaic and armyworm are common but are, in most cases, adequately controlled.

Yields of pigeon pea, soybean and cowpea are expected to be normal this year at approximately 1 tonne/ha.

The main oilseed crops grown in Myanmar are sesame, groundnut, sunflower, niger and mustard. The area under sesame, groundnut and niger has, according to the MoAI, increased over the last 15 years, while that of sunflower and mustard, after peaking in the late 2000s, has returned to about the same level as 2001. Grown mostly in the drier parts of the country, these crops were less affected than others by Cyclone Komen.

The area under sugarcane has fluctuated over the last 15 years within a range of between 146 000 and 181 000 hectares, but yields have steadily increased from 45 to 63 tonnes/hectare. Over the same period the area under rubber increased more than three-fold from 186 000 hectares to its present 641 000 hectares. The increase in the area under oil palm in the high-rainfall coastal areas of the country has been even steeper, from 29 000 hectares in 2001 to 153 000 hectares in 2015.

6. LIVESTOCK, FISHERIES AND AQUACULTURE

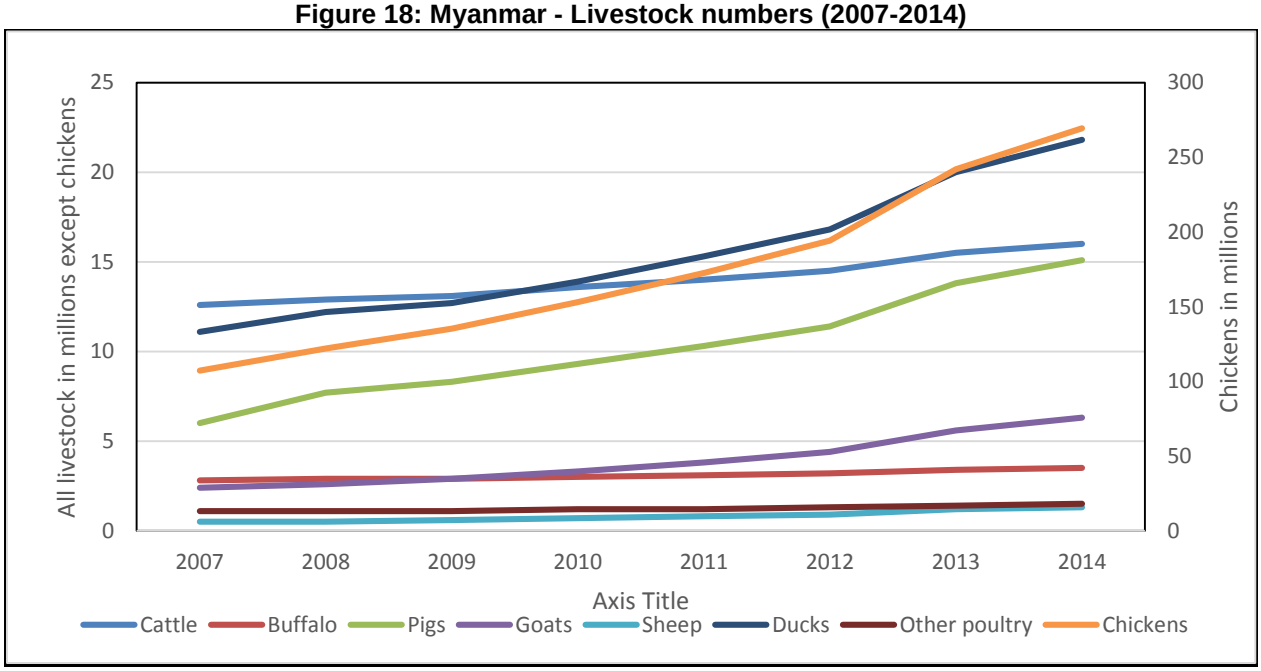
Livestock is an integral component of the agricultural sector and livelihood system in many parts of Myanmar, with households, particularly in the dry zone, deriving both income and food from their animals. The most recent official estimates show that most livestock numbers exhibited a very rapid increase between 2007 and 2014 (Table 14 and Figure 18), with those of pigs, goats, sheep and chickens more than doubling. The increase in cattle and buffalo numbers is surprising in view of the fact that most townships that the Mission visited reported that numbers of draught animals were declining as a result of increasing farm mechanization.

Table 14: Myanmar - Livestock numbers[1/] (2007-2014)

	2007	2008	2009	2010	2011	2012	2013	2014	Change 2014 over 2007 (%)
Cattle	12.6	12.9	13.1	13.6	14.0	14.5	15.5	16.0	27
Buffalo	2.8	2.9	2.9	3.0	3.1	3.2	3.4	3.5	25
Pigs	6.0	7.7	8.3	9.3	10.3	11.4	13.8	15.1	152
Goats	2.4	2.6	2.9	3.3	3.8	4.4	5.6	6.3	163
Sheep	0.5	0.5	0.6	0.7	0.8	0.9	1.2	1.3	160
Chickens	107.1	122.0	135.2	153.0	172.6	194.2	241.9	269.3	151
Ducks	11.1	12.2	12.7	13.9	15.3	16.8	20.0	21.8	96
Other poultry	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	36

Source: Livestock Breeding and Veterinary Department, MLFRD, Myanmar Livestock Statistics (2015).
1/ Millions.

Figure 18: Myanmar - Livestock numbers (2007-2014)



Source: Livestock Breeding and Veterinary Department, MLFRD, Myanmar Livestock Statistics (2015).

By developing the potential for aquaculture in the Ayeyarwaddy delta region, Myanmar has doubled its fisheries production in the last decade, with fish and shrimp becoming major export commodities. Fisheries production in 2014 amounted to 5.3 million tonnes. The sector is now hugely important in terms of employment, with an estimated 1.27 million fishermen and 220 000 fish farmers. More than five percent of all agricultural households in Myanmar are engaged in fishing[3].

Livestock that were unaffected by the floods were generally in good condition. Common livestock problems include haemorrhagic septicaemia, black quarter and Foot-and-Mouth Disease (FMD) but all are reported to be under control. Adequate cold-chain provisions for the control of FMD are said to be in place.

6.1 The effects of Cyclone Komen on livestock and fisheries

Approximately 236 000 chickens were lost as a result of flooding. Losses of cattle, buffaloes, goats, sheep and pigs, though significant at the local level, were slight on a national scale (Table 15). Most mammalian deaths resulted from drowning, exhaustion, starvation and hypothermia. Infection of cattle with sand mites was reported to be a problem in areas that had been flooded; infected animals were treated with Ivermectin.

[3] Government of the Union of Myanmar. National Natural Disaster Management Committee. October 2015. Myanmar Post-Disaster Needs Assessment of Floods and Landslides July-September 2015.

Table 15: Myanmar - Livestock losses as a result of flooding

State/Region	Bovines	Goat/Sheep	Pig	Chicken	Duck	Horse
Kachin	6					
Kayah						
Kayin						
Chin	91	67	99	890		55
Sagaing	369	26	870	95 371		
Tanintharyi						
Bago			15			
Magwe	129	215	442	15 490	255	
Mandalay	31					
Rakhine	5 309	2 665	3 178	9 745	2 200	
Yangon			7	43 257	45	
Shan	13		57	1 453	90	
Ayeyarwaddy	25	5	637	69 778		
Total	**5 973**	**2 978**	**5 305**	**235 984**	**2 590**	**55**

Source: Livestock and Veterinarian Department and CSO.

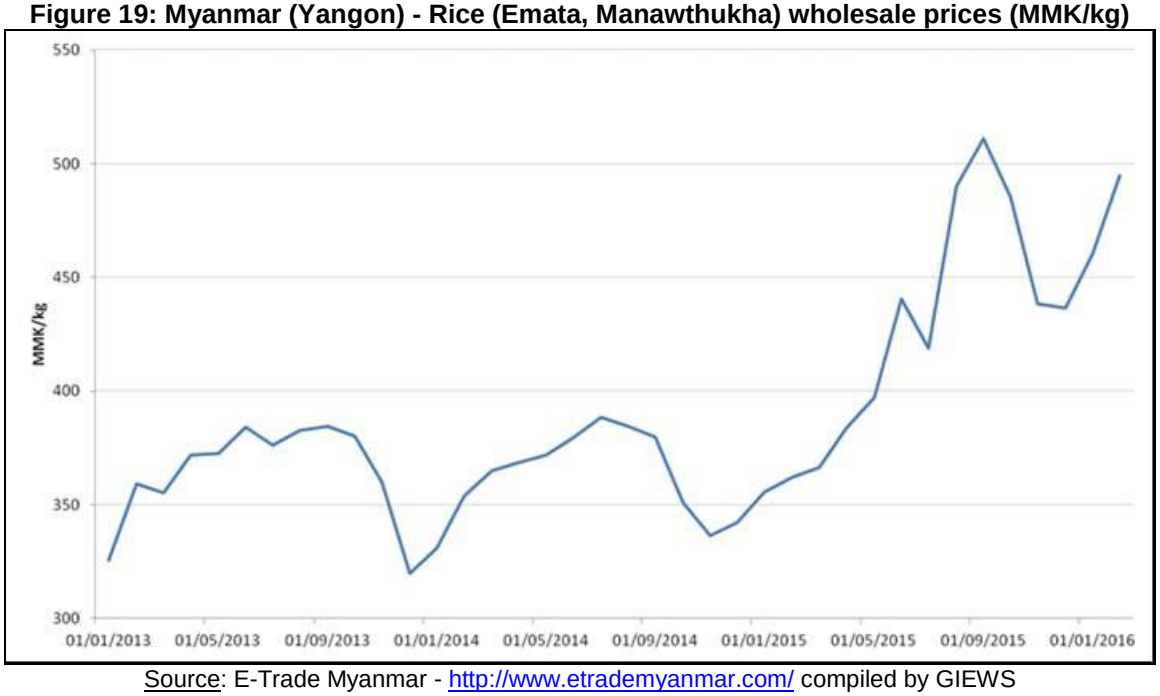
The Department of Fisheries recorded damage to 13 578 hectares of fish ponds. According to the Livestock and Veterinarian Department almost 23 000 hectares of shrimp ponds were damaged, 99 percent of which were in Rakhine.

7. FOOD SUPPLY AND DEMAND OUTLOOK FOR MARKETING YEAR 2015/16 (OCTOBER/ SEPTEMBER)

7.1 Rice price trends

Retail prices of rice seasonally decline in October and November following the start of the main harvest, and tend to bounce back immediately in the post-harvest period when most farmers have already sold their paddy, peaking in August and September. Normally, prices are highest in the remote areas of the north-west, including Chin and Kachin States. These are the country's main deficit areas, partly as a result of poor transportation infrastructure. As illustrated in Figure 19, retail prices of most consumed Emata rice in Yangon rose steadily between November 2014 and October 2015.

Figure 19: Myanmar (Yangon) - Rice (Emata, Manawthukha) wholesale prices (MMK/kg)



Source: E-Trade Myanmar - http://www.etrademyanmar.com/ compiled by GIEWS

Discussions with rice traders, millers, farmers and district DOA officials during the Mission confirmed key factors supporting the increase in rice prices in 2015 compared to 2014:

Increasing rice exports to China: Whether officially recorded or illegal, exportation of Myanmar rice to China has been growing to significant levels[4], particularly for certain varieties (e.g., Kayin Ma) which are used in China for the production of snacks, rice flour and noodles. The level of demand from China and the ease with which rice can be moved freely across the border are important drivers of the price of rice in Myanmar. For example, when build-ups occur in Muse, traders and millers noted that this acts to drive down prices, which also transmits to lower farm gate prices. According to one trader's records, approximately half of the paddy grown in Bago Region ends up in Muse for export to China.

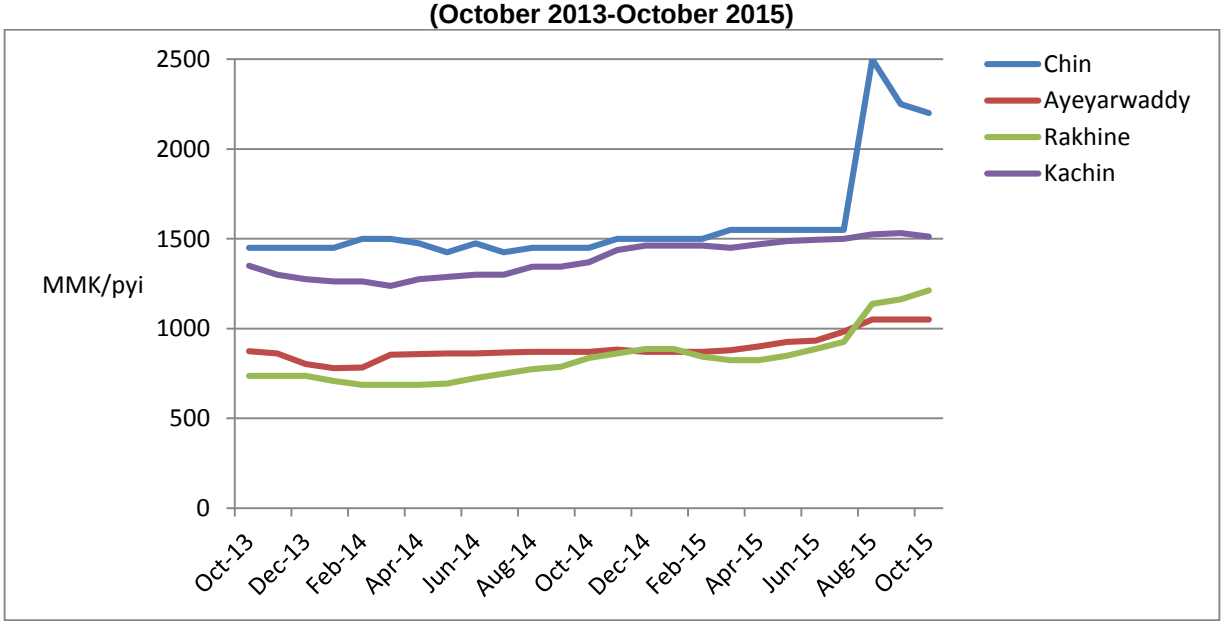
Depreciation of the MMK: Among the most explanatory factor is the continued depreciation of the MMK against the US dollar and currencies of key trading partners (see Section 2.3 - Exchange Rate), which has prompted increased import demand from neighbouring countries. In particular, the above-normal seasonal price surges recorded between July and September 2015, when prices rose steeply in all markets, often reaching record levels, were underpinned by a stronger depreciation of the MMK in those months.

Increased production costs and agricultural labour shortages: Day labourers, upon which small-holder farmers depend for land preparation, transplanting, and harvesting, are increasingly migrating to other areas within Myanmar (namely Yangon and Nay Pyi Taw) and abroad (Thailand, Malaysia, Singapore and the Republic of Korea) to find work opportunities that are more stable, predictable, and less physically demanding. Shortages of agricultural labour has put upward pressure on farm gate prices as farmers negotiate to cover some of their increased labour expenses due to such shortages. In 2015 the daily wage for agriculture labour was reported throughout middle and lower Myanmar to be 30-50 percent higher for men and women compared to 2014 (see Section 8.2 below for more detail).

Concerns over the flood-related crop losses: The strong upswings in rice prices during July and September were further underpinned by uncertainty about crop damage due to Cyclone Komen and delays in harvesting and milling of rice, coupled with strong demand from private buyers.

Temporary disruption of transportation routes: Supply shortages, particularly in the remote areas following flood and landslide damage to roads, bridges and railways, also supported prices. In parts of upper Myanmar (Sagaing, Kachin, Chin, and Rakhine), the floods were reported to have had an impact on rice and non-rice prices in the local markets. For example in Chin state, retail rice prices surged by more than 60 percent from July to August. In Rakhine the situation appears to have normalized rather quickly.

Figure 20: Myanmar - Retail prices of Emata rice in different markets (1 pyi=1.28 kg) (October 2013-October 2015)



Source: Myanmar Central Statistical Organization.

[4] National Export Strategy: Rice Sector Strategy 2015-2019. Republic of the Union of Myanmar. Myanmar Ministry of Commerce and International Trade Centre. March 2015.

Subsequently to the floods, domestic rice prices declined from October with the arrival of the new harvest into the markets, but they remained at high levels. By February 2016, prices of Emata rice in the main Yangon market were 37 percent higher than a year earlier (in nominal terms) and close to their records in September (see Figure 19).

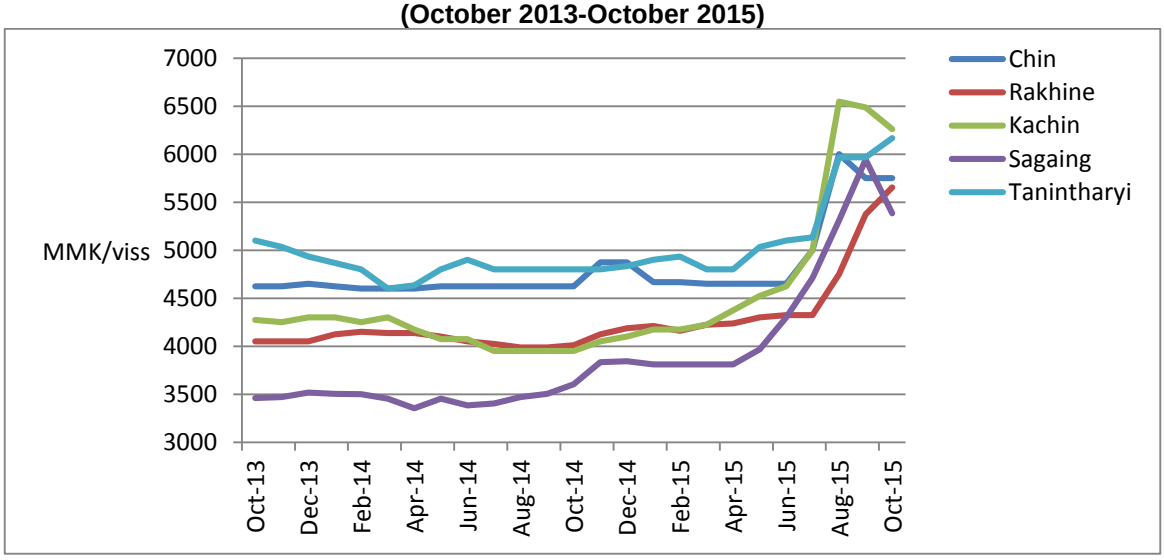
7.2 Market availability

Overall, the Mission found little evidence to indicate that the functioning of retail and wholesale markets and trade had been materially impacted by the July 2015 flooding. Based on extensive interviews with traders and millers throughout the townships visited it can be concluded that the availability of rice and non-rice items in local markets was mostly sufficient and the volume of sales were in line with that of 2014. The intra-regional supply and demand of rice appeared to have largely equilibrated by the time of the Mission (though some frictions/gaps, discussed below, did reportedly materialize during the immediate aftermath of flooding). For example, discussions with traders in Myingyan Township (Mandalay Region) indicated that there was limited impact of the 2015 flooding on the availability of rice in the local market. Even while paddy rice from Mandalay plays a very small role in the overall rice supply chain (more important are groundnut and sesame production), traders managed to import successfully from other areas (Bago, Yangon, Ayeyarwady) and the market prices for a 50 kg bag (MMK 20,000 to MMK 25,000) were similar to those found in other townships during the Mission.

A few traders suggested that, in the immediate aftermath of the flooding, the rice price surge was limited as inflows of rice from Thailand effectively serve as a ceiling for the price of rice in Myanmar (i.e. once the price of rice in Myanmar approaches that of Thai rice, cross-border inflows increase). It is the Mission's belief that the elevated prices observed for rice will persist into 2016 given that the factors explained above are unlikely to reverse anytime soon. Tighter domestic supplies in marketing year 2015/16 (October/September) compared with last year, reflecting flood related crop losses, are expected to further underpin already high rice prices, raising concerns about food access by the most vulnerable section of the population.

Similarly to rice, prices of groundnut oil increased sharply from mid-2015 peaking between August and October (Figure 21).

Figure 21: Myanmar - Retail price of groundnut oil in different markets (1 viss=1.6 kg) (October 2013-October 2015)



Source: Myanmar Central Statistical Organization.

Sub-national price discrepancies were reported for several food commodities, including meat and fish in Rakhine, prices of which rose proportionally more compared to rice. However, the prices of those commodities imported from China increased perhaps mainly due to the weakening MKK. The prices of tomatoes and onions were also elevated, a boon to those farmers who grew them during 2015, as were pulses prices in upper Myanmar where this staple plays a large role in meeting dietary needs of the population.

Findings from the WFP conducted survey during the CFSAM appear to confirm the preceding qualitative results. Among the key informants interviewed at the village level (i.e. village leaders), none reported that the July flooding had affected the rice availability in the market, but rice prices increased due to above

mentioned factors. Among this same group of leaders, 21 percent indicated that the physical damage caused by the floods to any nearby infrastructure was likely to have significantly impacted the food security situation of households in the village.

7.3 Spatial market integration

According to the price data provided by CSO (see Figure 20) price variations exist between states/regions, which implies overall weak spatial market integration. These differentials indicate that local markets are constrained by several factors including:

- High trucking costs due to the weak transport infrastructure:
  Road density in Myanmar is the lowest in Asia, with 40 km per 1 000 km^2, 50 percent lower than Lao PDR, which has the second-lowest road density in the region. Myanmar's road network does not cover all townships, and road conditions are often poor, especially during the rainy season (May-October). The rail network, too, is poor. These constraints force trucks to carry small loads over long distances, thus increasing the average transportation cost per unit of food product. Limited competition of transport services also contributes to the high unit cost of transport in Myanmar.
- Weak market intelligence, inadequate market transparency and lack of early-warning indicators:
  The links between farmers and markets are weak. The majority of farmers are not aware of the crop prices at the nearest market town before they sell their produce. Similarly, most farmers are not aware of the latest market opportunities concerning consumer preference and price competitiveness.

7.4 Cereal supply and demand balance for 2015/16

The forecast supply and demand situation for the 2015/16 marketing year (October/September), presented in Table 16, is based on the following assumptions:

Population: The total national population at 1 July 2015 is estimated by UN-DESA at 53.897 million. Based on an implicit annual growth rate of 0.8 percent taken from the UN-DESA the Mission estimates the mid-year population for October 2015 to September 2016 at 54.220 million.

Production: In aggregate, paddy production in 2015, including the 2015 main monsoon season and the ongoing 2015 secondary summer season is forecast by the Mission at 27.5 million tonnes (in paddy terms), which is 3 percent lower than the previous year's output and 2 percent lower than the three-year average. Maize and wheat production in 2015 are estimated at 1.3 million tonnes and 200 000 tonnes, respectively.

Milling rate for rice: The processing landscape in Myanmar is dominated by small-scale village level mills (hullers) and the state of the machinery used appeared dilapidated resulting in comparatively low milling rate. The commercial mills in Ayeyarwaddy, Bago, Magwe and Mandalay report a 60 percent milling rate. This rate is applied to the Mission's paddy rice production forecast to derive the milled equivalent production figure used in the balance sheet. No other grains are converted to milled form as the food and non-food requirements are expressed in the whole-grain form.

Stocks: The Mission gathered some information on the total level of cereal stocks held in the country at the beginning and the end of the marketing year (i.e. in the hands of the Government, Myanmar Economic Corporation, Myanmar Agribusiness Public Corporation, Rice and Paddy Traders, millers, traders, industrial enterprises, farmers and private households at the beginning of the marketing year). However, given the lack of reliable data, in particular for the amount of reserves in private hands, for the purpose of the balance exercise only the estimated variation in stocks during the year is shown. The Mission assumes a 100 000 tonne draw-down of rice stocks during the 2015/16 year reflecting the lower 2015 output forecast, while no change is envisaged for maize and wheat.

Cereal consumption: In Myanmar, there are differing views on rice consumption. MoAI's rate for the average per capita rice consumption for the 2014/15 marketing year is 313 kg (15 baskets) for the rural population and 250 kg (12 baskets) for the urban population. The 2012 CSO Household Income and Expenditure Survey estimated the average rice consumption per month per person at 11.3 kg, which will result in an annual per capita rice consumption of 135.6 kg. Similarly, the Myanmar Rice Federation carried out a rice-consumption survey of approximately 500 randomly sampled households in 2013/14 and found that rural dwellers consumed annually between 160 kg and 170 kg per capita and urban dwellers consumed between 120 kg and 140 kg. However, these estimates do not include out of home rice consumption, gifts or other non-paid receipts, rice based processed food, such as cakes, biscuit, noodles, snacks and chips. Pending more accurate figures on milled rice consumption in the country, an annual per capita consumption of 196 kg is used in the construction of the cereal balance. This rate is based on the apparent average

consumption of the previous three years using historical data from FAO/GIEWS Country Cereal Balances. Including other cereals, mainly maize and wheat, the total average annual cereal consumption per capita amounts to 212.9 kg per person.

Seed rates: The average seed rate for paddy is estimated at 125 kg per hectare, based on the seed rates used in the country, allowing for some multiple planting/sowing. This accommodates the following seed rates commonly used by farmers:

3 baskets/acre (155 kg per hectare)[5] for broadcasting.
2 baskets/acre (104 kg per hectare) for transplanting.

The seed rates are converted into milled basis to accommodate the methodology of FAO/GIEWS rice balance. As a result, 93 kg per hectare (milled basis) are used for broadcasting and 62 kg per hectare (milled basis) for transplanting.

The maize seed rate is 15 kg per hectare (0.25 baskets/acre)[6], and wheat seed rate 120 kg per hectare.

Feed: A minimum amount of rice, mostly broken and discarded food, is used to feed livestock. The Mission estimates the feed requirement in 2015/16 marketing year at 4 percent of rice production and 60 percent of maize production. Wheat is not used to feed animals.

Post-harvest losses: In 2011 and 2012 a study on Post-Harvest Losses (PHL) of paddy was carried out by the Department of Agricultural Research and the DoA. Overall PHL ranged between 13.8 percent (for the mechanized postharvest chain – e.g. mechanized harvesting and threshing etc.) and 20.9 percent (traditional manual postharvest chain). However, this study was not comprehensive, as it covered only Ayeyarwaddy, Bago and Yangon and focused only on the monsoon season crop losses at the farm and miller levels. By some accounts, the secondary (summer) paddy crop PHL can be even more significant due to the lack of drying facilities and the timing of crop harvests, which coincide with the beginning of the monsoon rains. Using the annual production of 27.5 million tonnes of paddy, and the percentage of mechanized harvest (20 percent) and manual harvest (80 percent) the resulting weighted average PHL stands at 19 percent. Pending more accurate figures of PHL in the country this rate is used for the Balance Sheet. As the study did not consider the PHL of other cereals, including maize and wheat, a rate of 11 and 16 percent, respectively, have been applied, which is consistent with PHL rates in other countries of the region. The Mission recommends that a study be undertaken to quantify losses at each stage.

Exports: The country is an exporter of rice, with recorded volumes amounting to 1.6 million tonnes in 2014/15 marketing year (October/September). However, it is assumed that large additional quantities are exported illegally, although precise figures are not available (Section 3.8 – Rice exports). In order to satisfy domestic consumption requirements, the total cereal exports in 2015/16 marketing year (October/September) are projected at 1.55 million tonnes of rice and 20 000 tonnes of maize. The projected rice exports are some 4 percent below last year's level, mainly due to the reduced output during the 2015 monsoon season.

[5] 1 basket of paddy weighs 46 lb (21 kg).
[6] 1 basket of maize weighs 55 lb (25 kg).

Table 16: Myanmar - Cereal balance sheet ('000 tonnes)

	Total	Rice	Maize	Wheat
Total domestic availability	**18 059**	**16 592**	**1 267**	**200**
Production	17 959	16 492	1 267	200
Stock draw-down	100	100	0	0
Total utilization	**18 456**	**16 592**	**1 267**	**597**
Food	11 520	10 627	341	552
Feed	1 448	688	760	0
Seed	614	594	7	13
Post-harvest losses	3 304	3 133	139s	32
Exports	1 570	1 550	20	0
Stock build-up	0	0	0	20
Estimated import requirements	**397**	**0**	**0**	**397**
Anticipated commercial imports	**397**	**0**	**0**	**397**
Estimated gap	**0**	**0**	**0**	**0**

Overall, as the country is a net exporter of rice, at national level, any potential deficit could be covered with lower exports in marketing year 2015/16 so to maintain consumption at normal levels. However, as discussed in Section 7.1 on markets, larger volumes of rice are exported unrecorded and due to the depreciation of the national currency, formal and informal exports to China are expected to remain steady. This, coupled with tighter supplies this season, is expected to result in high levels of prices, raising serious concerns about access to food by the most vulnerable section of the population.

8. HOUSEHOLD FOOD SECURITY AND VULNERABILITY

The food security situation of a region or household can be assessed along a set of underlying factors or determinants: availability, accessibility, and utilization. Gaps or deficiencies in any one of these conditions can precipitate short-term (transitory) or, for those households already experiencing marginal situations, longer-term (chronic) food insecurity that negatively impacts a household's well-being and ability to thrive. As such, especially following acute or rapid onset shocks – natural disasters, etc. – it is important to explore these components to determine whether disruptions have occurred and, if so, to identify the implications for relief and recovery options for the affected population.

The analysis below presents an overview of the qualitative and quantitative food security findings from the 2015 Myanmar CFSAM along the three key factors outlined above. Where existing secondary data was available, this has been included as appropriate for comparative purposes.

8.1 Livelihoods

Even while the functioning of markets appeared satisfactory at the time of the Mission (see Section 7.1), the July flooding had the potential to disrupt the livelihoods and income-earning potential of households in affected areas, thereby negatively impacting their ability to purchase food from the markets and/or consume their own crops. The Mission visited villages throughout Myanmar to interview farmers and day labourers to better assess their current ability to access sufficient food for their families and to understand how they anticipate situation to evolve in the coming year.

Among the households visited in middle and lower Myanmar, farming and daily wage labour were the predominant livelihoods. Many of the farming households in this part of the country expressed that what was most problematic about the 2015 flooding was its relative timing: because it occurred during the period when rice in flood-prone areas is traditionally transplanted, many were forced to repurchase inputs and harvest much later than normal (i.e. December and January). Thus, for farming households, while many experienced losses of their initial planting, the major impact of the July flooding appeared related to the increased costs required for buying inputs for replanting. Fortunately, most farming households in Myanmar (i.e. those owning land) have comparatively good access to loans/capital from both the Government-run MADB as well as the Cooperative Bank (and with good borrowing terms – e.g. 0.45 percent interest through MADB).

Moreover, countering the negative impacts of the July flooding are the secular trends noted above which, at least for the 2015 monsoon paddy season, stand to produce much higher incomes for the overwhelming majority of farming households that managed to obtain some harvest. Among the most consequential of benefits is the arbitrage scenario which resulted as farmers bought their 2015 monsoon season inputs in June/July when Kyat was denominated much stronger; farm gate prices during the harvest reflected a much weaker Kyat and had zoomed to MMK 340,000 per 100 baskets. Though a one-time event, this is expected

to help farmers to realise much more than the MMK 100,000/acre threshold that has been difficult for most to reach in recent years.

In addition to higher farm gate prices for paddy, the July flooding can be expected to have a positive impact on paddy production in the Dry Zone townships on account of better water conditions and improved soil fertility. Indeed, farmers and DoA officials in Magway reported yield increases for monsoon paddy of 10-20 baskets per acre compared to the 2014 season. Shop owners selling agriculture inputs in the various cities of Magway reported a noticeable increase in the volume of sales for the 2015 winter cropping season, which they attributed to cash-flush farmers from better monsoon season earnings. As a result, the winter season crops in the Dry Zone areas (e.g. mung beans, green gram, and maize) are expected to have good production as well. (Most farmers visited in middle and lower Myanmar were able to grow two or three crops in a calendar year).

There were reported challenges at the sub-national level, most notably in Rakhine. Households relying on rice production sales had to replant two or three times and use their rice stocks (normally reserved for own consumption) to replant or to borrow seeds from larger farmers. The next monsoon paddy cultivation is expected to be especially difficult due to the lack of financial access to inputs, the death of draught cattle and the lack of availability of good quality seeds; small-holder farmers have been particularly affected. The subsequent delay in the 2015 monsoon harvesting season and the unusual scarcity of income generating activities is expected to increase the lean season from one to two months in Rakhine State.

Compared with land-owning farmers, the livelihoods and income-generating capabilities of the landless and day labourers appeared more fragile at the time of the Mission. The landless and daily wage labourers were observed to have disproportionately increased vulnerability. The underlying reasons for this are interlinked:

- Due to the July flooding, many agricultural wage labourers had to wait, in many cases three to four weeks, for the flood waters to recede before replanting could commence; this created a significant gap in wages during August. Following from this, due to delayed replanting in many areas, some agricultural daily labourers reported facing abnormal income gaps during the traditional harvest period as well (November/December).
- Compounding this vulnerability, day labourers and the landless have significantly less access to loans and capital compared to farming households. As a result, the landless are forced to borrow at much higher costs. At the time of the Mission, day labourers in Myingyan reported that retail traders were loaning 50 kg bags of rice to be repaid within six months at a cost of MMK 38,000. Thus the process of expenditure smoothing which most affected households resorted to in some fashion as a result of the flooding was much costlier for the landless.

Countering these conditions for daily wage labourers were several positive trends that were reported at the time of the Mission. Skilled agricultural wage earners in particular have benefited from the growing shortages of such labour in rural areas. Daily wages ranged between MMK 4,000 to MMK 5,500/day for men and MMK 3,000 to MMK 4,500/day for women, and increase of 30-50 percent compared to 2014. However, it is not clear whether the observed increases in daily labour wages will keep pace with expected inflation associated with the secular price trends noted above. There is also a considerable dependence among such households on remittances from Yangon, Nay Pyi Taw, and elsewhere abroad. Reported remittances ranged from MMK 100,000 to MMK 300,000/month in remittances alone. This serves as a (tenuous) safety net for landless households.

The main vulnerabilities were observed among those households which were both landless and also did not have access to considerable domestic/foreign remittances from family members. This includes especially those households that were dependent upon wage labour which is non-agriculture based, e.g. those working in road construction which pays considerably less than skilled agricultural labour.

Compared to middle and lower Myanmar, where skilled agricultural labour plays a more important role in the livelihood profile, those working in the teak and mining sectors of upper Myanmar (Sagaing, Kachin) reported their wages were less impacted by the July flooding.

Findings from the household survey present a somewhat more complex narrative compared with the above qualitative results. While only 40 percent of households in the survey reported cultivating any crops during the 2015 monsoon season, 85 percent of these said that their harvest was/would be less than normal; only

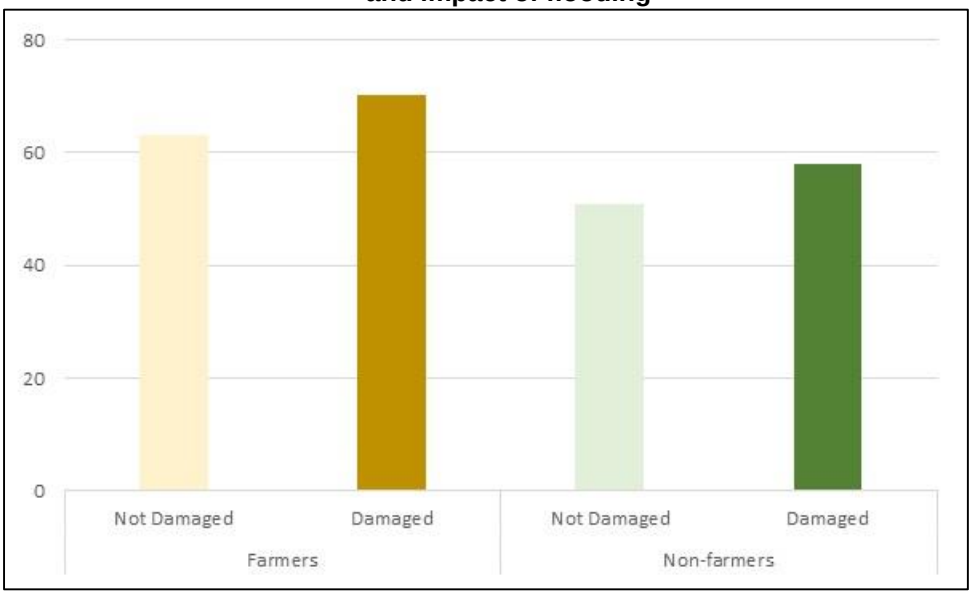
7 percent expected a harvest above average[7]. In line with this finding, 81 percent also indicated that they expected to sale less of their 2015 harvest compared to a normal year, suggesting that the farmers captured in the survey had underperformed (on account of the July flooding). Among farming households, 56 percent further reported that they were planning to cultivate winter season crops[8].

The survey also gathered information on the income-earning potential of households. Exploring further the possible impacts of the July flooding on strategies employed at the household level, the survey revealed that 14 percent of all households reported that the number of income earners living in the household had decreased compared to one year earlier. However, farming households were more likely to report a smaller workforce compared to non-farming households at the time of the Mission (20 percent vs. 9 percent, respectively).

This aligns well with the finding that, among those surveyed, farming households were almost twice as likely to report that their house and/or property had been flooded or damaged by the July floods (69 percent vs. 37 percent). However, there did not appear to be any difference in the migration patterns of farming and non-farming households as a result of the flood.

Figure 22 below presents the proportion of households (according for farmers and non-farmers) reporting that their income at the time of the Mission (previous 30 days) had decreased compared to one year earlier. These findings suggest that households reportedly affected by the floods (house/property had been damaged) were more likely to have experienced a decrease in income and that farming households in particular were more affected in this regard than non-farming households.

Figure 22: Myanmar - Percentage of households experiencing a decrease in income by livelihood and impact of flooding



One potential explanation which may bridge the qualitative and quantitative findings above lies in the fact that “non-farmers” includes all types of livelihoods, including skilled craftsmen and those working in business. The median per capita monthly income for those households depending primarily on casual labour was just MMK 13,000, the lowest among all livelihoods queried (data not shown). Moreover, income for farming households is relatively lumpy and distortions in harvest timing may also have reduced year-on-year income realization. The Mission holds that those households depending primarily upon day labour, and especially non-skilled day labour, remain among the most vulnerable and in need of support.

[7] The livelihood mix of households in the CFSAM survey appears tilted more towards non-farming households than would have been expected had a pure probability-based sample been drawn.

[8] For this discussion and figures which follow, “farming households” have been defined as those which reported cultivating any crop (not just rice) during the monsoon season; “non-farming” households represent the balance.

8.2 Food access and coping mechanisms

Significant changes in either the availability of food items in the markets or the underlying capability of a household to resource sufficient quantities of food for its members often manifest in the household-level consumption patterns and coping strategies. Households that face acute or chronic challenges accessing food often depend upon a range of food- and non-food-related mechanisms to bridge this gap.

Indeed, conversations with villagers during the Mission revealed that, regardless of livelihood, many reported having reduced the quantity of meat and other expensive food items that they were consuming compared to the previous year. Consumption of rice, however, was said to have remained consistent with that of normal times. Findings from the household survey appear to confirm this general observation. Figure 23 below presents the distribution of households according to the reported primary source of rice/cereal in the previous week. Own production was the main source of rice among farming households in Kachin and Kayin; it accounted for roughly 20 percent in the remaining Regions visited. Food aid was a significant source of rice for non-farming households in Ayeyarwady and Chin; it played a very minor role for non-farming households in the other regions surveyed. (One issue which could not be deduced is whether the "cash" used for cash purchases was from loans or savings/reserves; this point is discussed further below.)

Figure 23: Myanmar - Main source of rice/cereal during previous week according to livelihood

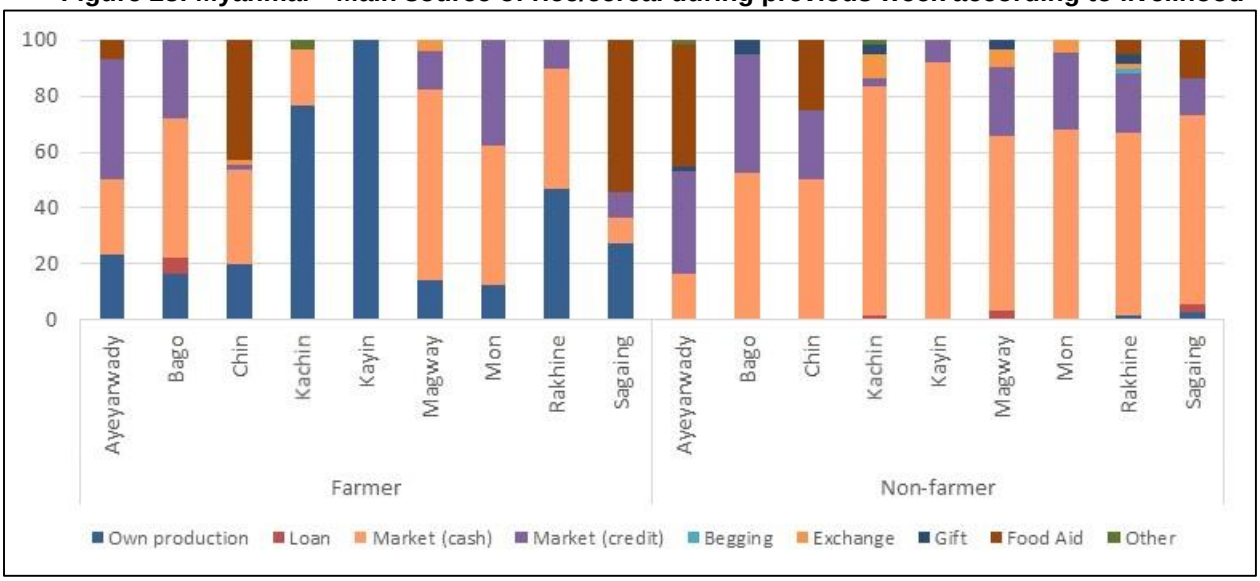


Figure 24 presents the Food Consumption Score (FCS) findings for households surveyed during the 2015 Myanmar CFSAM[9]. The regions presenting with the lowest quality diets according to the FCS were Chin, Rakhine, and Magway.

[9] The Food Consumption Score (FCS) combines food diversity, food frequency (the number of days each food group is consumed) and the relative nutritional importance of each food group. For each food group the frequency represents the number of days an item was consumed, with a range from 0 (never) to 7 (every day). A weight is assigned to each food group, representing its relative nutritional importance.

Figure 24: Myanmar - Food Consumption Score results by state/region

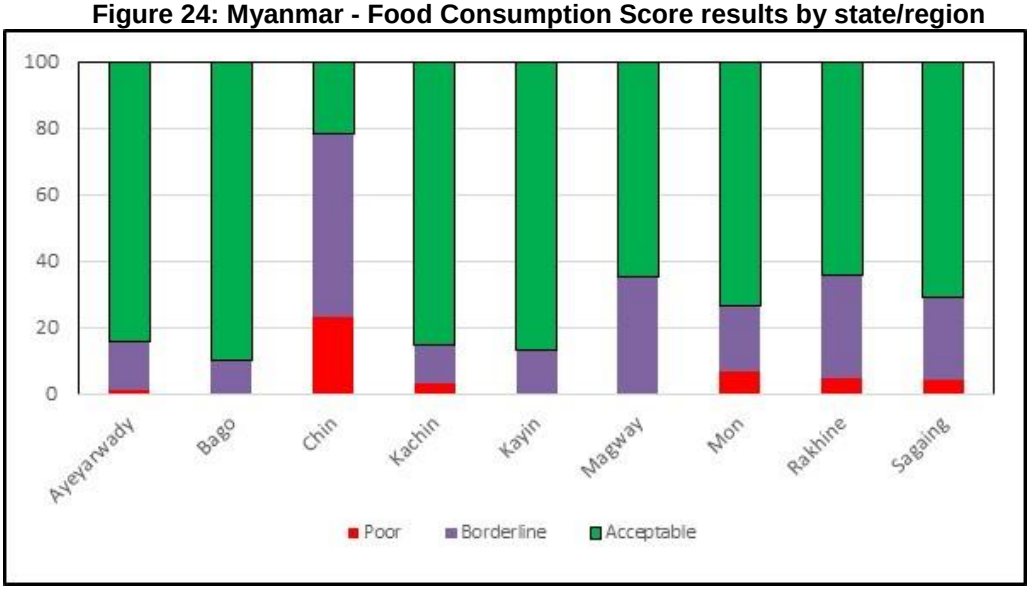
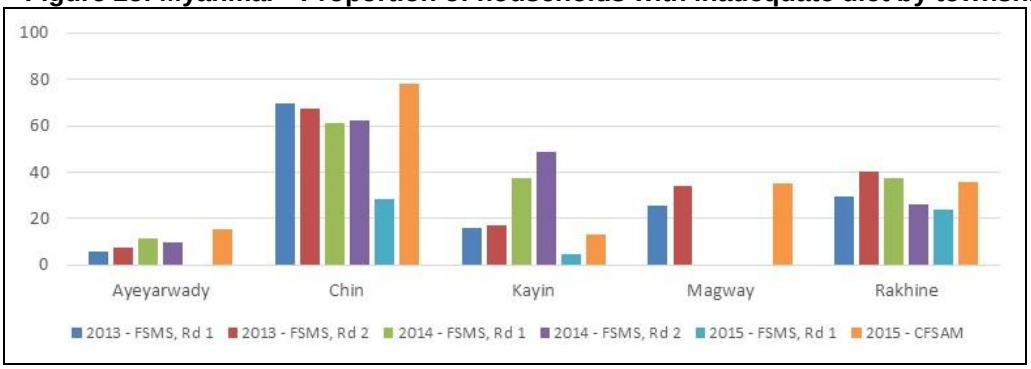


Figure 25 presents the FCS findings from the household survey against the biannual data collected by the Food Security Monitoring System (FSMS)[10]. As indicated, the proportions of households reportedly having an inadequate diet (i.e. poor or borderline FCS) in the different regions at the time of the Mission are of a similar magnitude to that found in previous rounds of the FSMS[11].

Figure 25: Myanmar - Proportion of households with inadequate diet by township

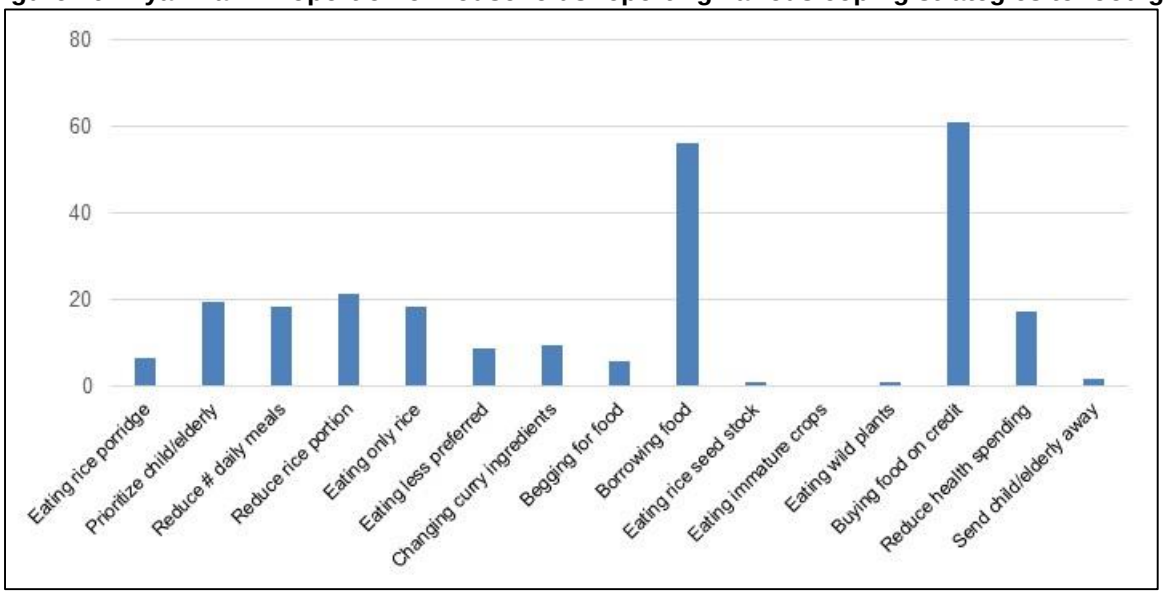


The primary means by which households reported coping with having either not enough food or money to buy food in the previous week are presented in Figure 26. Among those households which reported experiencing a food gap in the previous week, the most commonly employed coping mechanisms were to borrow food from neighbours or relatives (56 percent) or purchase food on credit (61 percent).

[10] The FSMS is a simple and low-cost food security monitoring system that is tailored to Myanmar and covers over 50 townships. Monitoring takes place twice a year (pre- and post-monsoon) combining quantitative and qualitative data collection. The quantitative data is sentinel-based, with Food Security Information Network members collecting information in monitored townships using core internationally recognized indicators of food security (such as the Food Consumption Score, Household Hunger Scale, the reduced coping strategy index). Along with the qualitative data, the totality of the evidence is used to classify the food security situation in each of the township monitored.

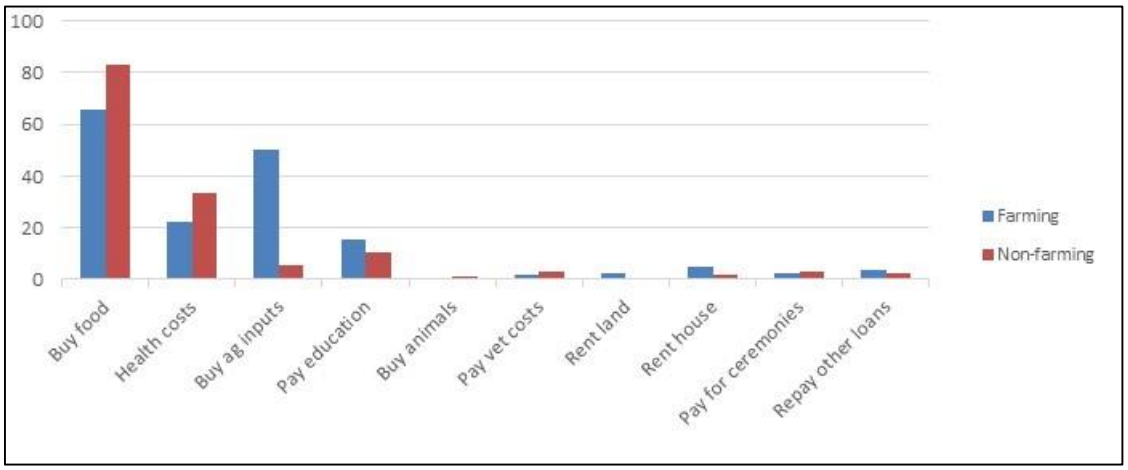
[11] To obtain the figures used for previous rounds of the FSMS, an average of the individual township data was generated. Given this gross simplification, these figures are presented for contextual purposes only.

Figure 26: Myanmar - Proportion of households reporting various coping strategies to food gap



The use of loans to cover short and medium-term gaps in income and food availability is a significant coping mechanism employed by all types of households in Myanmar. Interviews with villagers conducted during the Mission revealed that farmers and day labourers who were unable to pay cash reported taking out loans (public and private) or buying on credit from the markets. Some farmers also reported the practice of selling a portion of their harvest in advance (to neighbours or millers) in exchange for either consumable rice or cash, depending on their main need. The results from the household survey reveal that nearly 80 percent of households had at least one loan and most households with a loan reported having taken on new loans (since July) *specifically because of the flooding* (71 percent). Figure 27 shows the relative distribution of how households reported spending this loan money according to livelihood[12].

Figure 27: Myanmar - Reported uses of money borrowed as a direct result of July flooding by livelihood



The amount borrowed also differed according to livelihood: the median amount reportedly borrowed by farming households was MMK 400,000 compared to MMK 200,000 for non-farming households; farming households were also more likely to have received their loan from a bank compared to non-farming households (21 percent vs. 5 percent). These findings are consistent with the main impacts of the July flooding on these households and the strategies that each employed in response to these effects.

[12] Figures do not add to 100 percent because multiple responses were allowed.

9. CHILD NUTRITION

9.1 Undernutrition situation analysis

In Myanmar, more than 1 in 3 children under 5 years old are too short for their age (1.5 million or 35 percent) reflective of chronic malnutrition. 1 in 13 are too thin for their age (8 percent) reflective of acute malnutrition (MICS 2011). Both forms of malnutrition have short and long term consequences on children's physical and intellectual development. While Myanmar reported small positive progress in reduction of stunting rate since 2000 (0.6 percentage points per year on average), the stunting rates in some areas are still alarming. Specifically, from limited data the most affected children live in Kachin, Kayah, Chin, Rakhine and Shan with Rakhine suffering the critical burden of both stunting and wasting. Micronutrient deficiencies are widespread, with non-universal coverage of Vitamin A supplementation, anaemia and thiamine (Vitamin B1) deficiency**.**

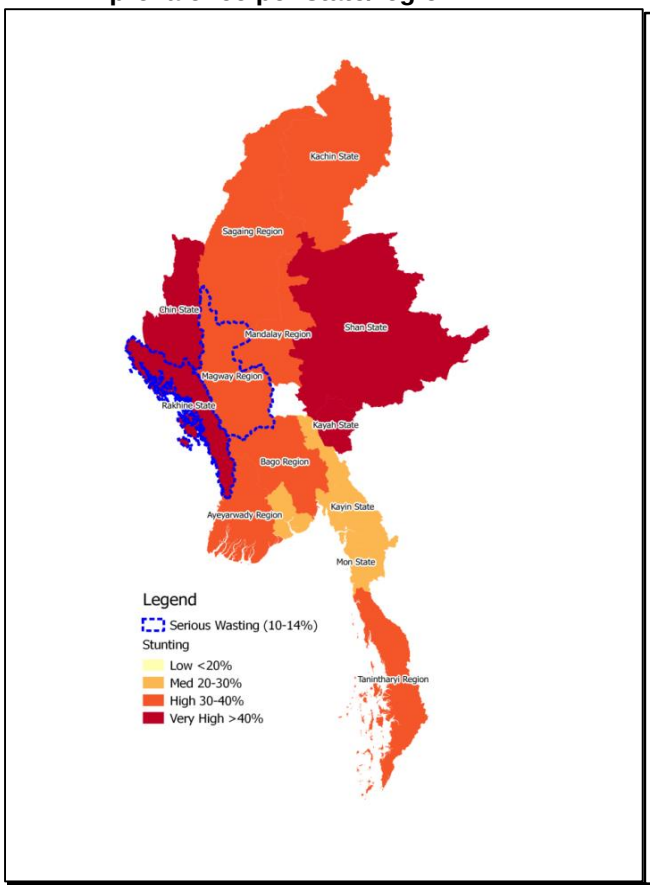
For the 2015 CFSAM, a scoping review of existing studies, grey and scientific literature provided limited data of the nutritional situation in Myanmar. In terms of scientific literature, this is not surprising as Myanmar ranked 218 out of 224 countries in number of publications in medicine per capita (McKee et al 2012). Poor quality of data as stressed previously (reported in USAID 2013, Dapice et al 2012), and the lack of reliable historical/ longitudinal data mean that trend analyses are difficult to carry over extended periods except in very limited geographical area where recent surveys were conducted. The lack of access of growth monitoring data and nutrition surveillance (children height and weight) at lower level prevented in depth understanding of the nutritional status among children. Two country-wide studies (MICS 2011, IHLCA 2011) were carried out in similar timeframe but provided very different information on the underweight rates casting doubts on both findings. Here we used MICS (2011) data to be consistent with other publications. It must be acknowledged here that the findings are not representative of displaced population living in temporary settlements, and in areas where there are security concerns, or affected by Cyclone Nargis as these were omitted from the sampling frame. This justifies the heavy use in this section of findings from nutritional studies carried out for some in the omitted population by MICS. Our review showed that most of these studies were carried out in Rakhine (48 percent), followed by Kachin (22 percent) and for the majority were SMART surveys (52 percent), done in IDP camps (48 percent) with 78 percent of them reporting nutritional outcomes.

9.1.1 Geographic disparities

While the nutritional situation at country level is considered serious according to international recognised threshold (WHO 1995), recent studies conducted in Kachin, Kayah, Chin, Rakhine and Shan still show an alarming situation with high/critical stunting rates at township and IDP camps level (from 28 percent to 52 percent global stunting in 2015) and both high/critical stunting and wasting rates in Rakhine (19 percent GAM and 46 percent global stunting in 2015) (ACF 2015). This is happening despite the humanitarian nutrition sector response in improving equitable access to essential nutrition intervention. Specifically in locations where nutritional response is in place, children's nutritional status has slightly improved but also deteriorated over couple years' time stressing the need for continuous effort to tackle, and prevent undernutrition. In Rakhine, wasting and stunting decreased in Maungdaw township (ACF 2014 (b), ACF 2015), in Sittwe urban township, Pauktaw (both wasting and stunting) and Sittwe rural areas (wasting only). In Kachin, stunting decreased (from 44 percent to 37 percent) while wasting increased (from 2 percent to 3 percent) (Plan 2014, 2015 (a))[13]. In areas not affected by conflict, the findings in the Dry Zone area (covering Magway, Mandalay and Saidang state/region) suggested that flood plains and irrigated areas were better off, and the highlands were worst with still a serious situation for wasting (SCI and WFP 2014). In terms of absolute numbers, Sagaing, Shan and Ayeyarwady region/states have the highest number of stunted under 5 years old children (Figure 28b).

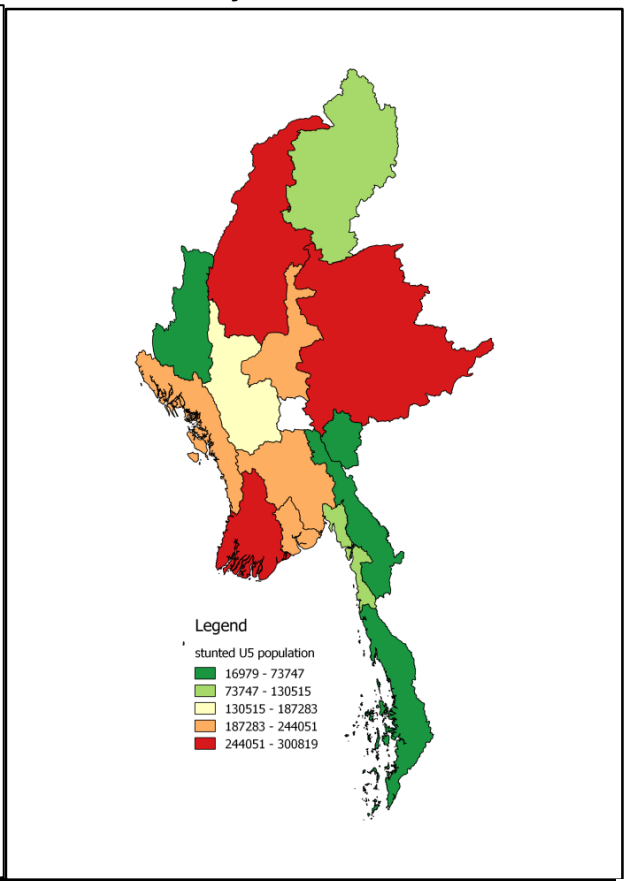
[13] The 2015 ACF survey was conducted in fewer townships.

Figure 28a. Wasting and stunting prevalence per state/region



Note: Wasting is only represented for prevalence 10 percent to 4 percent.
Source: WHO classification.

Figure 28b. Number of stunted under 5 years old children



Note: Green lowest and red highest number.

9.1.2 Stunting

At country level, stunting was associated with rural location, geographic areas, poverty and maternal education (MICS 2011, SCI 2013, ACF 2014 (b)). Scientific evidence shows that the immediate causes of stunting are diarrhoea/enteropathy/intestinal worm infections, intrauterine growth restriction, breastfeeding behaviours, respiratory infections, previous wasting and previous stunting (LIST 2014, Lantagne 2014, Khara 2014) and that the recommended interventions should focus on improving nutrition and prevent related diseases. In Myanmar, some possible causal factors include lack of adherence to exclusive breastfeeding and complementary feeding recommendations, lack of access to improved water and sanitation, lack of medical care, lack of resources and livelihoods, and cultural beliefs surrounding nutrition during and after pregnancy (Plan 2015 (a), Plan 2015 (b)).

9.1.3 Micronutrients deficiencies

Micronutrient deficiencies are widespread, with data on Vitamin A, anaemia, thiamine (Vitamin B1) showing lack of coverage of Vitamin A supplementation programme and anaemia, thiamine deficiency among children. Vitamin A deficiency has been estimated to affect between 4 percent to nearly 33 percent of preschool-age children (UNSCN 2010, reported in NPAFN 2013). The biannual supplementation of Vitamin A has reduced the prevalence of Bitot's spots[14] to acceptable levels in 2000 (reported in NPAFN 2013). Nevertheless, the latest MICS survey (2011) did not show universal coverage in children under five years of age (68 percent) and recent studies showed even a lower coverage in localised population (38 percent to 45 percent in Kachin, 45 percent to 80 percent in Rakhine). The 2015 CFSAM findings showed a coverage of 74 percent of the children included. Continuous effort should be deployed to improve coverage and reach the recommended 95 percent coverage in emergency context (SPHERE 2015). The anaemia prevalence in Myanmar is high (around 70 percent in children and 60 percent in women) (Zhao et al. 2014). Vitamin B1

[14] Bitot spot are signs of critical Vitamin A deficiency.

deficiency is common in Myanmar as a consequence of a white-rice based diet, and its severe form Beriberi is the second leading cause of death among children more than a month to one year old which accounts for 17 percent of all deaths in this age group in Myanmar (UNICEF 2015 unpublished). Since 2012, micronutrient sprinkle supplementation started for under-three children in 23 townships and results of the upcoming micronutrient studies will be able to assess its efficacy.

9.2 Understanding the root causes of undernutrition in Myanmar

While undernutrition seems to be recognised by communities, its associated root causes are less understood (ACF 2014 (b)). In conflict affected areas, the adverse political and socio-economic environment provides a clear unfavourable environment to tackle nutrition. Nevertheless there is not enough evidence to determine what the children-related risk factors are in Myanmar. These gaps in understanding should be explored further.

The evidence on the impact of conflict on children's nutritional status is limited. Only one study in Shan, Kayin, Bago, Kayah, Mon and Tanintharyi areas of Myanmar showed that health and nutritional outcomes were worse off among households that were displaced (Parmar et al 2010). Other studies conducted only in displaced population showed alarming nutritional situation.

In South East Asia, young girls tend to be more malnourished than boys (World Bank data 2015). Here, the data on gender and nutritional status in Myanmar show some important difference but in the absence of statistical test for some, it is impossible to clearly assess whether girls or boys are more vulnerable to undernutrition at this stage. In some studies, there was no notable difference found in the nutritional status of male and female children (MICS 2011, ACF 2014 (c), SCI 2014 (b)) while in others, there was difference in stunting or wasting (ACF 2013 (b), SCI and WFP 2014, SCI 2015). In Sittwe and Pauktaw, the findings on wasting (girls better off than boys) tend to contradict OTP admission number as OTP receive more girls than boys. In addition, data using MUAC cut-offs showed a higher percentage of females underweight and severely wasted (MUAC<115) in localised areas in Sittwe. Only one study (WFP 2015 unpublished) explored gender discrimination and nutritional outcomes in northern Rakhine and Sittwe and showed male preferences in feeding practices and health behaviours. Our CFSAM survey findings did not bring any evidence of gender discrimination.

Similar findings on age do not allow identifying at what age children are mostly at risk. In MICS (2011), the age pattern shows that the highest prevalence of underweight is found in children aged 48-59 months, highest coverage of stunting is found in children aged 24-47 months and highest rate of wasting is found in children aged 12-23 months. These are in accordance with scientific evidence on the timing of undernutrition. Nevertheless, in localised areas, different pattern are identified; in Kachin younger children seem to be slightly more at risk of stunting than older children which was explained to be linked to camp's living condition and impact on diet (SCI 2014 (c), Plan 2014). In terms of wasting, in the dry zone, older children (54-56 months old) were more likely to be wasted (SCI and WFP 2014). This surprising finding was explained by the trends in sicknesses which were also affecting older children.

9.3 Infant and young children feeding practices

In South East Asia, Myanmar showed the worse rate of exclusive breastfeeding (EBF) and timely introduction of complementary feeding when compared to other countries using similar studies in 2005 (Dibley et al 2010). Five years later, infant and young children feeding practices are still suboptimal; exclusive breastfeeding remains low (24 percent of infants 0–5 months in 2010) and complementary food is introduced too early or too late (69 percent of infants 6- 8 months in 2010) (MICS 2011). The rates vary widely within Myanmar stressing issues with timely introduction of complementary and failing to meet the minimum acceptable diet but with better exclusive breastfeeding practices in localised areas.

Timely initiation of breastfeeding varies from 63 percent in Bago to 92 percent in Mon state (MICS 2011) with good rate in localised areas (87 percent in Sittwe) (SCI 2015). In localised areas, the continued breastfeeding rate at 1 and 2 year varies from good in Rakhine to poor in Kachin (ACF 2014 (c), SCI 2014 (a)). Our CFSAM findings confirm these mixed results with 63 percent of the children ever breastfed and 82 percent of the under 2-year old children still being breastfed. Only one in three children aged two and under eat sufficiently diverse diets with grains being the most common food group consumed, followed by Vitamin A fruits and vegetables, other fruits and vegetables, and flesh foods (LIFT 2013). Dietary diversity varies depending on agro-ecological zones in Myanmar; for example, children from the Hilly zone were more likely to be eating Vitamin A fruits and vegetables while children from the Dry zone were more likely to be eating legumes and nuts, and eggs or children from the Coastal/Delta zone were more likely to be eating flesh foods and dairy products compared to the other children (LIFT 2013). In the conflict affected areas, the

percentage of children consuming the minimum acceptable diet in Rakhine is alarming low, at 2 percent in Buthidaung and 3 percent in Maungdaw (ACF 2014 (a)). Complementary food is introduced too early (4 months in Rathetaug) or too late (SCI 2014 (a)). In IDP camps, meal frequency and diet diversity are suboptimal. Financial constraints, beliefs, lack of knowledge but also the consequences of displacement may contribute the lack of quality and quantity in children's meal. Further research should be undertaken to explore the determinants of undernutrition in relation to infant and young children feeding practices.

9.4 Health

In Myanmar, the immunization coverage is high but the burden of morbidity is heavy with high prevalence of soil transmitted helminthiasis despite the national deworming programme (21 percent in school aged children) (Tun, Aung, et al. 2013). Intestinal helminths are detrimental to the child's growth and contribute to stunting and anaemia with infant and young children being at most risk. In localised areas, high reported cases of morbidity (diarrhoea, ARI, fever, runny nose, and scabies) contribute to poor nutritional and health outcomes. Diarrheal disease is the fourth leading cause of under 5 years old in Myanmar representing 16 percent of infants (from 1 month to a year old) deaths (UNICEF 2015 unpublished).

Low birth weight is a proxy for death and morbidity in children. In Myanmar, the rate of LBW is recognized as underestimated (9 percent) because infants at birth are not systematically weighed (only 56 percent) (MICS 2011).The mortality rate for children under 5 is 51 deaths per 1 000 live births in 2013 with 45 percent of these child deaths are attributable to various forms of undernutrition (UNICEF 2013 unpublished). From evidence in localised areas, morbidity incidence based on 2 weeks recall fluctuate from approximately 40 to 70 percent with data on diarrhoea well above the 7 percent of national average (MICS 2011, ACF 2014 (c), SCI 2015, ACF 2013 (a), ACF 2013 (b)). The 2015 CFSAM data show similar morbidity rates; 12 percent for diarrhoea, 33 percent for cough and 20 percent for fever. Morbidity incidence fluctuates by season with the rainy season reporting more cases of diarrhoea, malaria, skin infection and fever in the rainy season, during the dry and cold season, a higher incidence of ARIs and fever reported (ACF 2014 (c)). Treatment for diarrhoea is suboptimal in Myanmar (only 15 percent of home management, 66 percent use of oral rehydration therapy) with non-systematic use of zinc (MICS 2011, SCI and WFP 2014).

9.5 Impact of 2015 flooding on children's nutritional status

Based on scientific evidence, flood-affected children have a higher risk of becoming more stunted in their growth a year later, and more wasted within few months after the flood. In Myanmar, limited evidence from existing studies shows an impact of the 2015 July floods on wasting and dietary intake (diversity and meal frequency) for children. The findings from CFSAM study demonstrate a moderate deterioration of the children's nutritional status and limited change in breastfeeding and complementary feeding practices due to flooding. An important increase in reported morbidity episodes due to flooding was identified. Repeated episodes of wasting and morbidity can lead to stunting in children, thus increased action towards nutrition resilience in already vulnerable children should be prioritised.

9.5.1 Flooding and nutritional outcomes

Women and children are typically the most vulnerable groups to flood impacts. Flood affected children suffer from a nutritional deterioration overtime including a delayed impact on wasting and stunting in the aftermath of flood (reported in Goudet et al 2011, 2010).

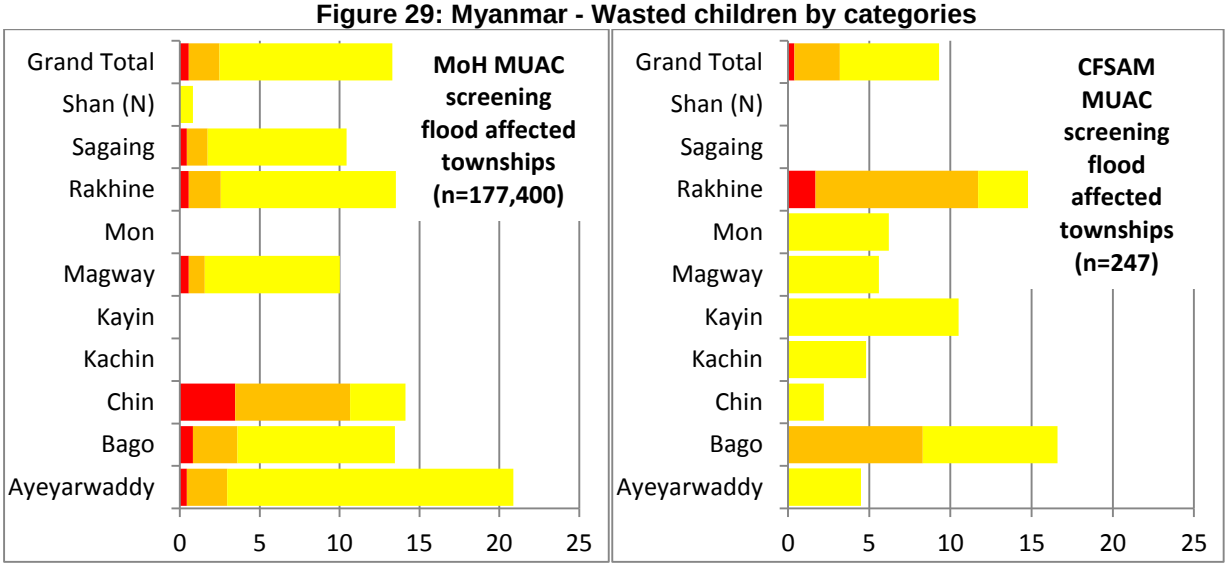
9.5.2 Myanmar, the July 2015 floods

In the **National Natural Disaster Management Committee** (NNDMC) report (2015), over 143 000 children under five years old were estimated to be affected by the July floods. Twenty percent of parents of under 2-year olds in Rakhine were reported to face problems feeding their children. In the flood monitoring final report, the lack of existing implementing partners, delays in nutrition supplies and absence of nutrition/health coordination meeting in some flood affected areas (e.g. Maungdaw district) were cited as causes of significant increase in nutritional insecurity. In Rakhine, the SAM non-responder rate doubled from July to August which was explained by the increase of sharing and selling practices of RUTF (Rakhine state nutrition 2015). The surveillance data from active screening in Rakhine shows a peak of GAM and SAM children in August, September and it could be hypothesized that it is the lag impact of flooding. Similarly the number of new SAM admissions increased in August. When exploring historical trends from 2013, August seems to be a month with a higher number of admissions as previously population are reluctant to move due to the rainy season. In Chin, surveillance data in four townships show that there were more MAM children in Mindat and Hakha and more children at risk in Thantlang in August. Only one study was conducted in the

aftermath of the flood (September-October 2015) with pre-flood comparable data (November-December 2013) (ACF 2014 (b), 2015).The findings show a decrease in meal frequency and child diet diversity.

The findings, based on the Ministry of Health (MoH) data[15] and on the 2015 CFSAM survey[16], show a prevalence of global wasting of 2 percent and 3 percent, respectively. Both studies were carried out three to four months after the July 2015 floods. Children at risk of wasting are high respectively 6 percent and 11 percent of screened children. High rate of global wasting at region/township level are demonstrative that children are still extremely vulnerable (Figure 29). Based on MoH data, children in Chin are worse off with 11 percent global wasting. The household survey shows similar prevalence for Rakhine.

Figure 29: Myanmar - Wasted children by categories



Axis: Regions/Prevalence (%)

Source: MoH and CFSAM household survey results (Red: SAM, Orange: MAM, Yellow: at risk).
Note: Kayah data were removed from MoH dataset as sample size was very small.

The findings from the CFSAM survey at village level showed that July flooding was perceived to have moderate impact on children's nutritional status and little impact on infant and young children feeding practices. Overall there was no association between the perceived impact on livelihood/food security and children's nutritional outcomes. Children were perceived to be thinner due to the floods in 40 percent of the selected villages with highest rate in Rakhine. In 18 percent of the selected villages in Ayeyarwady, Bago, Chin, Kayin, Magway and Sagaing, the number of breastfed children was reported to have decreased due to flooding. The quantity of complementary food for children aged 6-23 months was stated to have decreased in 18 percent of the villages, mainly in Ayeyarwady, Chin, Magway, Mon and Sagaing. Specifically, in villages located in Sagaing, Kayin, Bago, Ayeyarwady, children were perceived to be thinner and were less breastfed (villages). There was increase in use of maternal milk substitute in 5 percent of the selected villages (in Chin and Sagaing) while change in diet of pregnant and lactating women was observed in 18 percent of villages (in Ayeyarwady, Chin and Sagaing).

The findings from the CFSAM survey at household level confirmed the impact of flooding on nutritional outcomes with 20 percent (40 out of 197) of the children perceived by their mother/caretaker to have suffered nutritional deterioration (mainly seemed weaker 47 percent and skinnier 35 percent) with the highest rate in Rakhine and Ayeyarwady. There was no difference between age groups. 91 percent of these children had a normal nutritional status at the time of the study (November-December 2015) based on MUAC while 0.4 percent were SAM, 3 percent MAM and 6 percent at risk of malnutrition. As reported previously, children in Rakhine are the worst off compared to the other regions (Figure 3). The fact that only a limited number of children were SAM at the time of the study while 35 percent were reported to have suffered nutritional deterioration could mean that children have already recovered. The findings on breastfeeding and complementary feeding practices reported at household level confirmed the limited impact of flooding on infant and young children feeding practices. Eight percent of children (8 out of 103) that were breastfed before the flood stopped receiving breastmilk during the floods due to availability of breastmilk substitute (in

[15] MoH data were collected using active MUAC screening done by MoH in 78 flood affected townships.
[16] CFSAM data were collected at household level using MUAC in 18 selected flood affected townships.

six cases) or reported insufficient breastmilk (in three cases) mainly in Rakhine and Kachin. Mothers reported a change in complementary food due to flooding for 7 percent of children with a decrease in the quantity and the frequency of food given reported. Finally, the results on morbidity show an important increase of episodes with more than half of the children that were sick due to flooding with fever was the most reported morbidity mainly in Rakhine.

10. RECOMMENDATIONS

10.1 Immediate

To cover immediate needs following the 2015 flooding, the Mission recommends the distribution of seeds for the next monsoon planting seasons in the most affected areas, including Chin, Rakhine and Ayeyarwaddy; as well as storage containers and post-harvest equipment. In Rakhine, Sagaing, Magwe and Ayeyarwaddy, recording the highest livestock losses, urgent replacement of livestock is required to avoid a fall in animal protein intake; while the rebuilding of fishing gear and boats, and rehabilitation of fish ponds is needed in the most affected Rakhine State.

There is also need to closely monitor the food situation in pocket areas, particularly in Rakhine and Chin, where food assistance may be required. In view of adequate rice availability and the well-functioning domestic markets within Myanmar, the Mission recommends that in case such assistance be needed, it be provided in the form of cash and/or vouchers.

10.2 Institutional

Improve agricultural data collection, collation and analysis and establish a National Information and Early Warning Unit on Food and Nutritional Security

Data on crop production, consumption, exports, stocks and a full cereal balance, is not always available and discrepancies exist among different institutions. By strengthening and expanding existing information systems and by improving the capacity of the personnel of the MoAI, the Department of Meteorology and Hydrology and the Central Statistical Organization to collect information, the accuracy of agricultural and food security information could be improved. It is also recommended to establish an Early Warning Unit, responsible for analysing and timely dissemination of updated information for policy makers and other stakeholders. This should include alerts on food security at all levels so that timely appropriate and coordinated mitigating actions can be taken to safeguard production and to improve the livelihood of the vulnerable population. A nutrition surveillance system to monitor nutritional status in all states and regions using international recognized indicators should also be implemented to facilitate better targeting of vulnerable children.

10.3 Agriculture

Development of on-farm and community grain storage

Due to a lack of appropriate on-farm storage, many farmers are unable to store their newly harvested crop with a view to selling it later in the marketing season when prices usually are higher. A cooperative community storage system (‘inventory storage’) could, in many situations, overcome this problem. Starting with a small amount of capital, the cooperative store is able, on receipt of the farmer’s produce, to provide him with the necessary credit to pay off his debts. The produce is kept in store until the price rises. Several farmers reported that they could keep their harvested grain in a trader’s or a miller’s store at a monthly cost, for sale later in the year; however, the price of rice often does not compensate them for the storage costs incurred. Improved storage would also reduce post-harvest losses due to fungal spores and insects.

Increase the availability of smaller farm machinery for hire

Mechanization assists in timely planting and reduction of losses in the field, especially at the time of harvesting. Many farmers are now investing in power-tillers which can cost between MMK 1.6 and MMK 2.5 million according to quality and provenance, but the majority of farmers who can afford mechanization depend on being able to hire machinery. At present most state and regional authorities that provide farm machinery for hire limit themselves to conventional tractors, tractor-drawn implements and combine harvesters. Provision of smaller equipment for hire such as power-tillers and hand-operated reapers should be considered. Such equipment is cheaper, more easily maintained and more easily repaired than the larger

equipment currently used. Being cheaper, more pieces could be made available to farmers, and being smaller, they could be used in fields that are too small or too difficult to access with larger machinery.

Monitor and control the use of certified seed

Certified seed of High-Yielding Varieties is produced by contracted farmers. However, the Government does not monitor or control the distribution or use of the produce. Reports from the field indicate that large quantities may be consumed as grain rather than used as seed.

Construct micro-dams in suitable areas

The substantial weaknesses observed in the areas of irrigation and water management, both of which are holding back farmers from increasing yields and harvests, requires large-scale investments in infrastructure and might be effectively addressed through a public works programme. Many areas could benefit from the construction of micro-dams for the production of high-value crops and nutritionally important vegetables. Such an effort could double as a cash-for-work (social protection) scheme for many of the underemployed, unskilled day labourers who are flocking to the cities or abroad. Coordination with development partners is an obvious opportunity for synergy in this regard.

Increase the availability of fisheries brood stock

Many fish and shrimp farms lost stock during the 2015 floods. Since only limited supplies are available in the country these farms may find it difficult to re-stock quickly to profitable levels. Strategically placed farms, primarily for the production of brood stock, should be established. These could either be state-sponsored or privately owned. With the dramatic growth in fish and crustacean exports in recent years, the latter option may present an interesting investment opportunity.

10.4 Household food security and child nutrition

Strengthen national mechanism for coordinated preparation and response to natural disasters

Discussions with Township- and District-level officials revealed that relief activities (by Government and development partners) were largely uncoordinated, weakly targeted, and driven according to the resources available locally. The household survey results reinforce this finding, showing that food aid was targeted differentially to farming and non-farming households according to Region/State. A more structured Emergency Preparedness and Response (EPR) framework (including supply prepositions and standby funding), the accountability of which is either centrally organized or decentralized to Region/District level, would reduce many of the inefficiencies described to the Mission by local officials and the affected population.

Government and development partners to design and operationalize cash and voucher-based responses

Anecdotal evidence suggested that private, large volume purchases of rice likely drove up the price of rice in the immediate aftermath of the July flooding. As noted elsewhere in this report, all indications are that the functioning of domestic markets within Myanmar were little affected by the flooding; rice and other goods quickly flowed to areas where anticipated (or reported) shortages existed. Both suggest that relief in the form of cash and/or vouchers would have, at minimum, been appropriate response options following the 2015 flooding. Given the differential access which farming and non-farming households have to loans/credit, and the substantial preference which farmers showed for buying agricultural inputs with loan money, significant consideration is warranted among relief actors to better develop and coordinate systems for the distribution of cash during relief activities.

One possible cash and voucher-related response strategy for supporting the livelihood activities of landless households (whose income has been negatively impacted) and marginalized farmers would be to target community asset creation (following the emergency phase). The main objectives of this approach would be to create temporary jobs for the affected community members and to rebuild/rehabilitate community and household assets that were damaged by the flooding and/or landslides. Cash and vouchers are an ideal and appropriate transfer modality for such a strategy. (Cash is only recommended in the areas where markets are well-functioning and there is no challenge to access the markets by the targeted communities.)

Increase access to financial services among non-landowning households

Following from immediately above, the current situation, whereby landowning households alone have easy and significant access to capital, has created a dichotomous reality for households in rural areas. Faced with acute shocks to their income/livelihood, non-landowning populations have only neighbours or private lenders from whom they can borrow (often at usury rates). Obvious lack of collateral notwithstanding, Government and EPR parties should consider alternative mechanisms that will necessarily prevent the downward spiral of negative coping which serves to trap many of these households into poverty.

Initiate trainings, job placement, and investment in non-agricultural-based income and livelihood areas/activities

As the farming sector continues to mechanize and unskilled labour continues its flight to urban or peri-urban areas within Myanmar (or abroad), efforts are increasingly needed to train and capacitate these potential workers for the new jobs which will drive Myanmar's economy.

Establish/strengthen a Government-led forum or committee which explores and develops action plan to address vulnerability among urban population to food and nutrition insecurity

The pace of urbanization in Myanmar can be expected to accelerate as the economy grows to depend more and more on non-agricultural sectors. In light of the experiences of neighbouring countries (e.g. Bangladesh, Cambodia), Government and development partners will be wise to explore this growing population and the unique vulnerabilities it faces with respect to food and nutrition insecurity. Urban areas, while holding the prospect of better employment opportunities and wages, also create fragmented communities with weak social networks (compared to rural areas), high rents and costs of living, and fewer available coping mechanisms to acute shocks.

Build resiliency in already vulnerable children before the rainy season

Implementation of nutrition disaster preparedness programmes before rainy season targeting wasted children to prevent further nutritional deterioration.

Improve coordination of a multi-sectoral approach to malnutrition

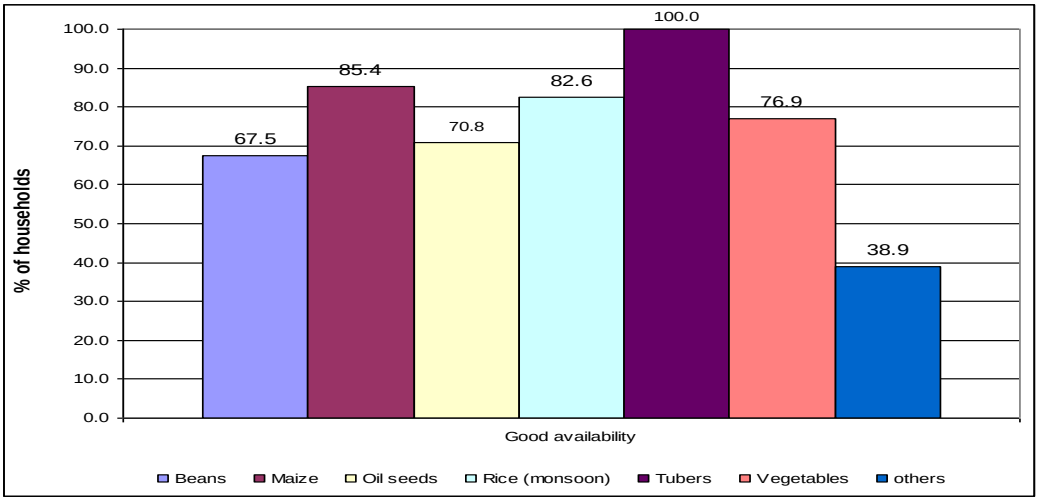
Access and practices to reduce morbidity incidence in the same areas where nutrition interventions are implemented. Specifically through improving water, sanitation, and hygiene access and practices to reduce related morbidity incidence that can contribute to malnutrition.

Annex

Seed availability and needs

The information in this section derives from a Household Survey undertaken by the WFP Myanmar Country Office and sub-offices during the Mission. These results should be taken as indicative, as the sample of household cultivating crops was only 40 percent of the interviewed households, which is not fully representative. Some 80 percent of these households (32 percent of interviewed households) were also cultivating during the winter season. Proportions of households cultivating different crops varied between regions, however, apart from this no major differences were found between the different regions or states regarding seed specific parameters. The questions were split into two parts: the first part was intended to capture the situation before the monsoon floods of July 2015, with the second part focusing on the post flooding outlook.

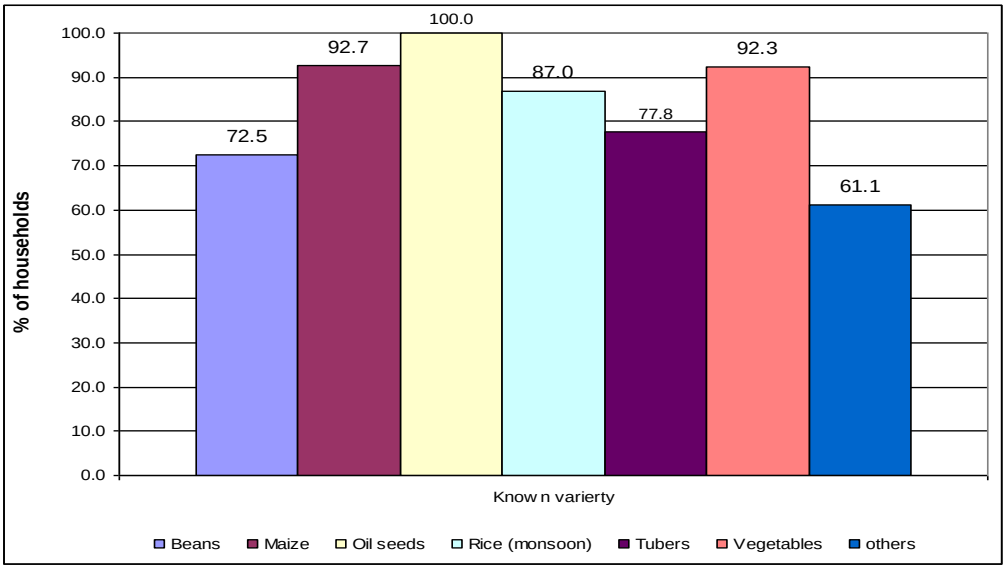
Figure 31a: Myanmar - Availability of seeds before the floods



Source: Data compiled by FAO from the Household Survey undertaken by the WFP Myanmar Country Office.

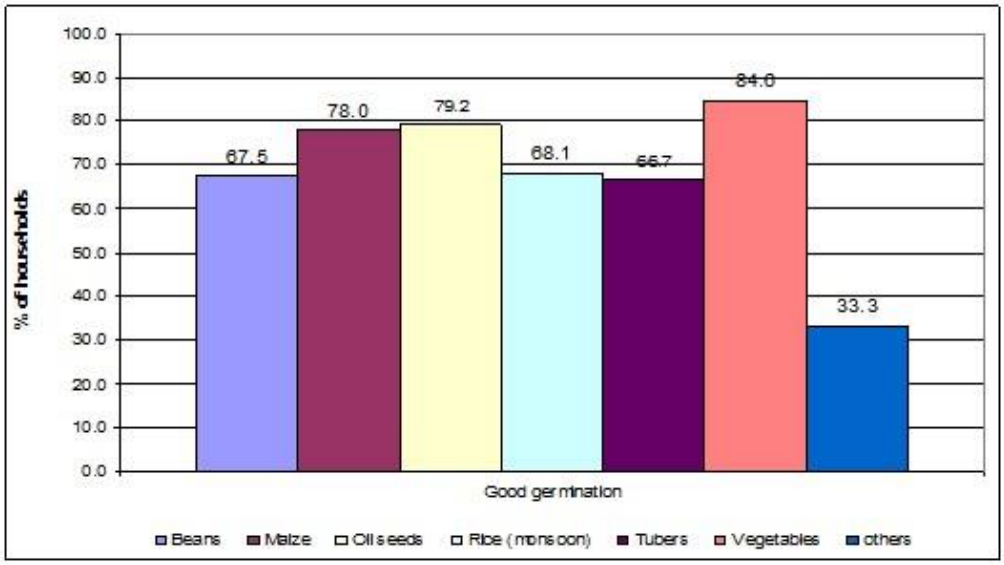
Trust in seed variety and quality of seeds planted in monsoon season 2015: for all crops, farmers are most likely to use seed varieties that they know (Figure 32a). There are a few possible reasons for this: first that they trust the varieties that they know; second that they do not want to take the risk of trying seeds that they don't know and third that they do not have the resources to purchase better quality seed. Around 70-80 percent, of farmers reported that germination rates of the seed which they planted before the 2015 floods was good (Figure 32b). Although the meaning of "good" was not defined. For vegetables the proportion of farmers stating "good" is higher due to the higher proportion of seed which was sourced from the formal sector. The germination rate of minor crops (mainly potatoes) seems much lower but this is of minor importance for household food security.

Figure 32a: Myanmar - Used known seed variety



Source: Data compiled by FAO from the Household Survey undertaken by the WFP Myanmar Country Office.

Figure 32b: Myanmar - Farmer perceptions of germination rate



Source: Data compiled by FAO from the Household Survey undertaken by the WFP Myanmar Country Office.

When farmers need to buy seed for maize, rice, beans, oil crops and vegetables, they do so in two main periods. First in the two to three months after harvesting (September-November). The cereals and oil crop seed is then stored and planted at the start of the following monsoon season. Some bean seed and the vegetable seed is also planted for cultivation in the winter season. The second main time for purchasing is in the months leading up to the monsoon (April-May). This pattern was evident in the buying and planting patterns in the run up to the 2015 monsoon and subsequent floods.

Seed availability and planting intentions for 2016: for 90 percent of the interviewed households, the harvest from the 2015 season was expected to be lower than usual due to the flooding. This could have implications for the availability of seed for next monsoon season. Almost all households who responded stated that they would be planting a winter crop for 2015 but in about half of the cases areas planted was expected to be lower than usual.

Overall, the importance of own planted seed for 2016 remains high, although the flooding appears to have had some impact on farmer access to own stored seed for tuber crops and maize, which has dropped by 10 percent compared to before the flooding. For most crops, the proportion of households stating that they would be using own saved seed for planting next year was between 65 percent and 78 percent, outliers being beans (54 percent) and rice (94 percent).