

QUICK SCAN MYANMAR



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LIST OF ABBREVIATIONS

3G	Third Generation
4G	Fourth Generation
ADB	Asian Development Bank
ADS	Agricultural Development Strategy
APCTT	Asian and Pacific Centre for Transfer of Technology
CAPSA	Centre for Alleviation of Poverty through Sustainable Agriculture
DALMS	Department of Agriculture, Land Management and Statistics
DIWRUM	Department of Irrigation, Water Resources Utilization and Management (previously Irrigation and Water Utilization Management Department (IWUMD))
DMH	Department of Meteorology and Hydrology
DoA	Department of Agriculture
DWIR	Directorate of Water Resources and Improvement of River Systems
EKN	Embassy of the Kingdom of the Netherlands
FAO	Food and Agriculture Organization of the United Nations
FMI	First Myanmar Investment
FSWG	Food Security Working Group
G4AW	Geodata for Agriculture and Water
GAFFSP	Global Agriculture and Food Security Program
GDP	Gross Domestic Product
GHG	Green House Gas
GIS	Geographical Information Systems
ICM	Integrated Crop Management
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
ITC	Irrigation Training Centre
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agricultural Development Bank

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MAPCO	Myanmar Agribusiness Public Corporation Limited
MCCA	Myanmar Climate Change Alliance
MCCSAP	Myanmar Climate Change Strategy and Action Plan
MFSPEA	Myanmar Fertilizer, Seed and Pesticide Entrepreneurs Association
MIMU	Myanmar Information Management Unit
MLFRD	Ministry of Livestock, Fisheries and Rural Development
MNTC	Myanmar National Tele & Communications
MoAI	Ministry of Agriculture and Irrigation
MoALI	Ministry of Agriculture, Livestock and Irrigation
MoC	Ministry of Cooperatives
MoECaF	Ministry of Environmental Conservation and Forestry
MoH	Ministry of Health
MoNREC	Ministry of Natural Resources and Environmental Conservation
MoPF	Ministry of Planning and Finance
MoT	Ministry of Transport
MPBSMA	Myanmar Pulses, Beans & Sesame Seeds Merchants Association
MPT	Myanmar Post and Telecommunications
MRF	Myanmar Rice Federation
NAG	Network Activities Group
NAPA	National Adaptation Programme of Action
NASA	National Aeronautics and Space Administration
NECC	National Environmental Conservation Committee
NESAC	National Economic and Social Advisory Council
NGO	Non-Governmental Organisation
NPAFN	National Plans of Action on Food and Nutrition
NSO	Netherlands Space Office
OCHA	Office for the Coordination of Humanitarian Affairs
RVO	Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland)
SDC	Swiss Agency for Development and Cooperation
SFSA	Syngenta Foundation for Sustainable Agriculture
UMFCCI	Union of Myanmar Federation of Chambers of Commerce and Industry
UAV	Unmanned Aerial Vehicle
UN	United Nations

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UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WB	World Bank
WFP	World Food Programme
WUR	Wageningen University and Research

1 INTRODUCTION

Within the framework of food security policy, the Ministry of Foreign Affairs of The Netherlands is implementing the programme 'Geodata for Agriculture and Water (G4AW) Facility'. The G4AW Facility aims to increase the agricultural sector output in G4AW partner countries. This is achieved by providing food producers with relevant information, advice and/or (financial) products through operational information chains using satellite data.

In March 2017, a new call for proposals will be opened. In this call, the Ministry of Foreign Affairs of The Netherlands calls for good quality project proposals from viable partnerships.

The Quick Scan serves as input for preparing the country visit and the G4AW information and matchmaking workshop in Myanmar. In the workshop the local context, constraints and challenges in agriculture will be discussed. Furthermore, the background and details of the G4AW Facility is provided and the development of partnerships is promoted.

This Quick Scan provides an up-to-date information assessment on agricultural and associated activities. It provides information from different perspectives and in a wider context (climate, water management). Additional, stakeholders from different types of organizations are identified and reported. The document is initially supporting the country visits and workshop, but the provided information can also contribute to the development of partnerships that are intending to bring forward a proposal in the second call of the G4AW Facility.

2 ASSESSMENT OF MYANMAR WITH A FOCUS ON AGRICULTURAL ISSUES

In this section, the most important challenges in the agro-eco systems in Myanmar are given as well as an overview of governmental efforts to address the food security situation.

2.1 MAIN CHALLENGES IN MYANMAR'S AGRICULTURE SECTOR

Myanmar's agriculture plays a key role in the country's economy, representing 30% of GDP (MoALI, 2015) and 25% of export earnings (MoNREC, 2016). With 61% of the people working in agriculture (MoALI 2014 according to MoNREC 2016) and the majority of the farmers being smallholders, the agricultural sector also plays a key role in the fight against food insecurity and poverty. Despite relatively favourable and diverse production circumstances, Myanmar's agricultural sector is significantly underdeveloped compared to other Southeast Asian countries like Thailand and Vietnam, probably mostly due to the long period of isolation and sanctions under military rule, from which the country has just emerged. The main agricultural products of Myanmar and their value are shown in the table below.

Table 1 – Main agricultural products and sown area in 2014/2015

Products	Sown Area ('000 hectares)
Paddy	7,170
Maize	459
Pulses	4,550
Sesame	1,581
Groundnut	949
Sunflower	484
Cotton	304
Sugarcane	181
Rubber	641
Oil Palm	153

Source: MoALI, 2015 Myanmar Agriculture in Brief

The main challenges for the agriculture sector in Myanmar that can be identified are climate change, access to finance for farmers, labour availability and access to machinery, access to knowledge, access to inputs, and the marketing of agricultural products (including livestock products). These main challenges will be discussed in separate sub-sections below.

2.1.1 CLIMATE CHANGE

Myanmar is strongly affected by climate change in different ways in the different areas of the country. Although there are many other more complicated ways to classify the agro-ecological zones of Myanmar, a practical classification for a general analysis of the impact of climate change is in the following three zones: Hilly Zone, Central Dry Zone and Coastal Zone (see figure 1 below).

Figure 1: Agro-ecological zones of Myanmar



Source: Government of Myanmar, 2012 according to MoNREC, 2016

In general climate change in Myanmar is characterised by higher temperatures, in general lower overall amounts of precipitation, more intense rainfall, more rainfall outside the monsoon, more (intense) storms outside the monsoon and rising sea levels. Although the effects vary greatly, also within agro-ecological zones, for the three main agro-ecological zones the main impacts can be characterised as following. (MoNREC, 2016, Slagle, 2014, Irrawaddy, 2015)

In the Central Dry Zone before the effects of climate change was felt, water was already a critical challenge to agriculture and livestock production. On top of that, climate change in the Dry Zone of Myanmar is characterised by shorter monsoons and declining overall amounts of precipitation, increasing temperatures and evaporation, and more erratic rainfall (droughts and flooding). For agriculture this has resulted in diminishing yields (in particular rice, sesame and sunflower), reduced fodder availability, and decreased livestock health and production. Besides, the occasional heavy rainfall and flooding can harm livestock and damage crops, as well as further erode the soil. (FAO, 2014, UNDP, 2011)

In the Coastal Zone the agriculture sector is suffering from more extreme weather events and related flooding, including outside the monsoon, which can damage crops. Rising sea levels mean that more agricultural lands become unsuitable or less suitable for agricultural cultivation, including due to salt water intrusion. The increased and more intense storms can create storm surges that can flood large areas of land with salty water, which, like cyclone Nargis in 2008, can have a long impact on the productivity of those lands. (MoNREC, 2016, Slagle, 2014)

In the Hilly Zone the agriculture sector is generally also suffering from more erratic rainfall, leading to both water shortages at times and more flash flooding with negative impacts on crops and soils. (MoNREC, 2016, Becker et al., 2015)

2.1.2 ACCESS TO FINANCE

Access to affordable finance is an important challenge for farmers all over Myanmar. In 2013 around 80% of rural households were estimated to have at least one loan from different sources. The biggest sources were family and friends (55%), money lenders (34%), government (MADB) (22%), micro-credit providers (21%), shopkeepers (20%) and presale of products to traders (8%) (LIFT, 2013). Moneylenders and shopkeepers in the Dry Zone are known to charge interest rates of 5-10 percent per month or more. (FAO, 2014) The private banking sector is still largely closed for foreign banks, and the domestic banks are still ill equipped to serve smallholder farmers. Yoma Bank is receiving technical assistance from Rabobank International to expand its agricultural lending. In recent years loans provided by the Department of Cooperatives through officially registered cooperatives, but largely used individually by farmers, have increased. This despite the historically negative perception of cooperatives by farmers (Ferguson, 2013).

2.1.3 LABOUR AVAILABILITY AND ACCESS TO MACHINERY

Especially young men are migrating to cities and abroad in search of better jobs. Women and elderly are often left behind to do work on the farms. The costs of hiring labourers is estimated to have increased significantly over the last few years. This makes investments in machinery increasingly attractive, but the high costs and the heavy indebtedness of farmers, as explained in the sub-section above mean these options are not available for many farmers (Wissink, 2017).

2.1.4 ACCESS TO KNOWLEDGE

Access to the right knowledge is also seen as an important impediment to agricultural development in Myanmar. Farmers currently have little access to high quality knowledge that can help them to improve their farming systems and increase their (long term) profits. The additional challenges posed by climate change mean that farmers are especially in need of effective knowledge services, as they have to adapt their farming systems to the changing climatic circumstances, partly by adopting new crops, trees, livestock and/or technologies with which individual farmers may have limited experience so far (Wissink, 2017).

2.1.5 ACCESS TO INPUTS

Access to physical inputs (besides machinery already discussed above) like high quality fertilisers, pesticides, and seeds is another important challenge for farmers in Myanmar. The application of fertilisers by farmers for crop production can be classified as moderately high in certain place, including the dry zone (FAO, 2014) but in other places it is thought to be rather low. Farmers' decisions on what type of fertiliser to use and how much is mostly based on practices by other farmers in their villages. Soils are becoming increasingly exhausted, due to poor soil maintenance, but exacerbated by climate change, resulting in higher (chemical) fertiliser needs and increasing costs to realise the same yields as before. Besides, the quality of chemical fertilisers being sold in Myanmar is questionable, and quality testing of fertilisers (at the point where they are sold to farmers) is very limited. (Roelofsens et al., 2015)

Pesticides availability in Myanmar has similar problems, with illegal pesticides crossing the border with being illegally imported and certain retailers selling mixed, fake or illegally repacked pesticides. (Peeters et al., 2015) Labels are often not in Burmese, so people often can't read any indications for use. (FSWG, 2014). Farmers are often not aware of the characteristics of the pesticides they use. They only get general advice from the retail shops where they buy the pesticides and don't know the spectrum of efficacy and mode of action of the pesticides they use. A big part of the more intensive agricultural practices in Myanmar depend on the use of a broad spectrum of hazardous pesticides for pest, disease and weed control. The use of alternative strategies, like Integrated Crop Management (ICM) is limited to only a small minority of farmers. (Peeters et al., 2015)

In the Central Dry Zone, and probably also in other parts of the country, the use of improved seed is very low, which limits the genetic potential of the crops sown. Limited access to finance as explained before, and the financial risks, may be an important reason for that. Besides, the limited availability of improved seeds is also an

important factor. (FAO, 2014) The government's system for seed production and distribution is currently not able to meet the demand of farmers. (APCTT et al., 2016)

2.1.6 QUALITY AND MARKETING OF PRODUCTS

The quality and marketing of agricultural products, livestock, and livestock products is another major challenge for farmers in Myanmar. Farmers often lack the knowledge on how to improve the quality of their products, and lack of mechanisms for price differentiation based on objective quality indicators, means that there are also no clear incentives for farmers to improve the quality of their products. (Wissink, 2017)

In the Central Dry Zone, and probably most other parts of Myanmar as well, most agricultural products as well as livestock is sold in the village to visiting buyers or brokers and then traded through local commodity exchanges and township markets, in the case of livestock. (FAO, 2014) Most farmers are not organised in cooperative like structures to pool their products in order to have a better negotiating position, and obtain better prices. This means that traders deal mostly with farmers individually, resulting in high transaction costs and lower prices. There are also regulatory barriers that prevent markets for some products to function freely and effectively. (Wissink, 2017)

Besides the functioning of the domestic markets, the functioning of export markets also pose barriers that lead to lower prices for farmers. For exports to more developed countries the quality of products is an important barrier. Regulatory barriers apply in varying degrees to exports to all countries. Exports of rice, livestock and meat products are restricted through government interventions, with regular border closures. (NESAC, 2016)

2.2 GOVERNMENTAL EFFORTS AND POLICY ON FOOD SECURITY

In the following paragraphs a general overview on the agriculture, food security and climate's policy framework is presented.

2.2.1 AGRICULTURE

Before the new government took office in March 2015, there were three ministries with a direct link to agriculture: The Ministry of Agriculture and Irrigation (MoAI), the Ministry of Livestock, Fisheries and Rural Development (MLFRD) and the Ministry of Cooperatives (MoC). The new government merged the three ministries into one Ministry of Agriculture, Livestock and Irrigation (MoALI). In the area of agriculture the new government has formulated the following important policy documents.

Second Short Term Five Year Agriculture Policies and Plans

Besides a vision, mission, goals and objectives, the document lists the followings policies:

- 'Right of land ownership, production of crops, livestock and fish policy.
- Water resources utilization of policy.
- Investment and procurement of farm machineries and equipment policy.
- Research, technology, inputs and human resource related policy.
- Natural environment conservation policy.'

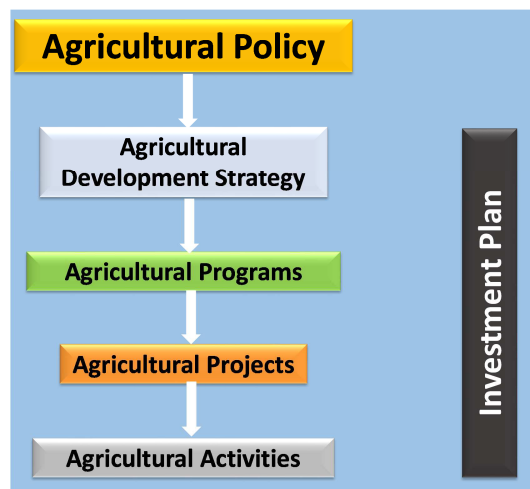
These policies are also worked out in more detailed programmes of work.

Agricultural Development Strategy (Draft)

As a requirement for the submission of a project proposal for the Global Agriculture and Food Security Program (GAFSP) fund (focused on the Central Dry Zone), MoALI also embarked on the formulation of a national level Agricultural Development Strategy (ADS), including an Investment Plan. The relation between the Second Short

Term Five Year Agriculture Policies and Plans (Agricultural Policy), the Agricultural Development Strategy, lower levels of implementation and the Investment Plan is shown in the following figure.

Figure 2 – Relation between policy documents and lower levels of implementation



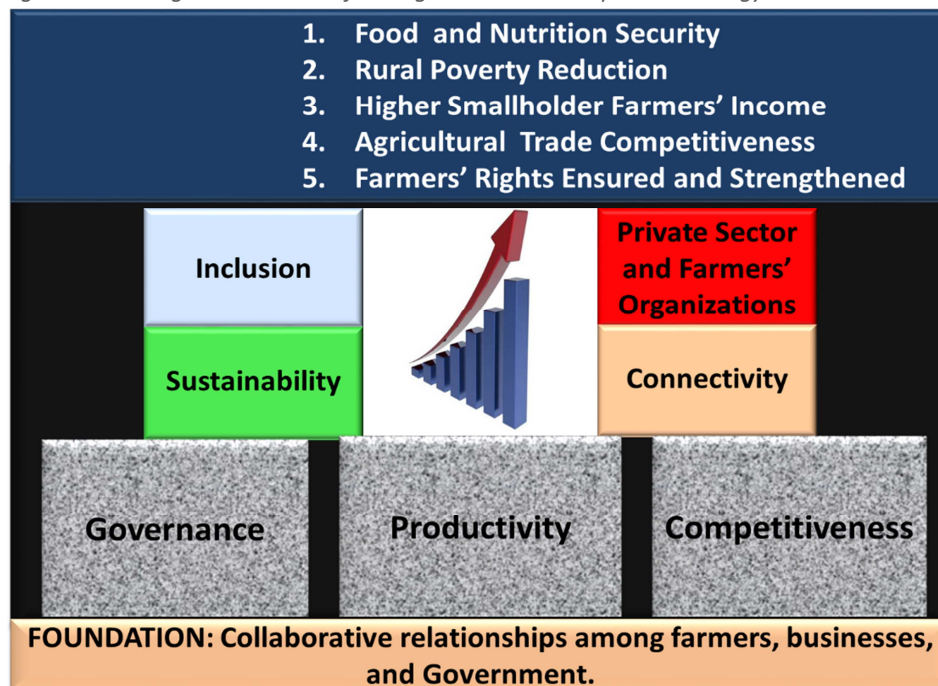
Source: MoALI, 2016, Agricultural Development Strategy and Investment Plan (Draft - December 2016)

The ADS, which was submitted as a draft document along with the project proposal, lists three main outcomes corresponding to the three strategic pillars of governance, productivity, and competitiveness:

- ‘Outcome 1 – Enhanced governance and capacity of institutions responsible for agricultural development
- Outcome 2 – Increased productivity and farmers’ income.
- Outcome 3 – Enhanced market linkages and competitiveness. ‘

The strategic framework of the ADS is represented in the figure below.

Figure 3 - Strategic Framework of the Agricultural Development Strategy



Source: MoALI, 2016, Agricultural Development Strategy and Investment Plan(Draft - December 2016)

During a meeting with MoALI on 26 January 2017, it was said that a reference to the use of new technologies such as satellite and geodata, cloud computing, mobile phone connectivity and crowd sourcing would be included in the Agricultural Development Strategy.

2.2.2 FOOD SECURITY

Food security is the responsibility of MoALI, but within this ministry food security is often understood as the food self-sufficiency ratio at the national level, with strong focus on rice as the main staple food. The policy documents related to agriculture listed above, refer also regularly to food (and nutrition) security. However, the Ministry of Health (MoH) has led the formulation of the National Plans of Action on Food and Nutrition (NPAFN), which approaches food and nutrition security rather at the household and individual level, but is in many areas dependent on MoALI to implement the action plan. Before the old government left the office a new NPAFN was formulated. However, it is currently not known whether the new government is adopting this document as one of its guiding policy documents.

2.2.3 CLIMATE CHANGE

Under the previous government Myanmar's National Adaptation Programme of Action (NAPA) to Climate Change was developed in 2012 by the National Environmental Conservation Committee (NECC) of MoECaF, the Department of Meteorology and Hydrology of the Ministry of Transport (MoT) and the United Nations Environment Programme (UNEP). Under the new government the Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2016-2030 was finalized and is expected to be published soon. An earlier version identifies six sectors to build adaptive capacity and to promote low carbon development. These six sectors are

- '1) Agriculture, Fisheries and Livestock,
- 2) Environment and Natural Resources,
- 3) Energy, Transport and Industry,
- 4) Cities, Towns and Human Settlements,
- 5) Climate Hazards and Health, and
- 6) Education, Science and Technology.'

The MCCSAP is supported by detailed sectoral action plans that identify time-bound priority actions.

The sector action plan on agriculture, fisheries and livestock, titled 'Climate Smart Agriculture, Fisheries and Livestock for Food Security' identifies the following sectoral aim, outcome and expected results

'Sectoral Aim: To maintain food and livelihood security of Myanmar by adopting climate resilient responses in agriculture, fisheries and livestock sectors including promotion of resource efficient and low carbon practices.

Sectoral Outcome: The agriculture, fisheries and livestock sectors maintained growth and productivity. livelihoods of dependent communities and households are supported and maximised GHG reduction potential by implementing climate smart responses.

Sectoral Expected Results:

- Climate change integrated into relevant policies, planning and budgeting procedures of the agricultural, fisheries and livestock sectors and are practiced by relevant actors;
- Climate resilient and environmentally sound adaptation technologies, and climate smart management practices are adopted by the agricultural, fisheries and livestock sectors, and are supported by international and domestic finance; and

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- Institutional coordination and multi-stakeholder engagement framework established and supported implementation of climate smart responses in the agricultural, fisheries and livestock sectors including innovative business models.'

3 ASSESSMENT OF STATUS AND PROBLEMS OF INFORMATION SUPPLY IN THE AGRICULTURAL SECTOR

For food security programs, actual and accurate (spatial) information is crucial for land and crop production systems to provide quick indicators on the context (e.g. water availability), status (e.g. biomass, crop type, acreage, etc.) and trends (within and in between seasons, years) of local farming practices/performance. In this section, the main challenges in information supply in Myanmar are summarized as well as the institutional capacity to support viable information services.

3.1 MAIN CHALLENGES IN INFORMATION SUPPLY ENCOUNTERED IN AGRICULTURAL ACTIVITIES

There are many challenges in information supply encountered in agricultural activities in Myanmar. Farmers' extension needs are not taken appropriately into consideration by the government. (Cho, 2013 and IFAD, 2014). Government extension services are focused mostly on maximising production, rather than maximising farmers' profits (in the context of the constraints that farmers face). Besides, the agricultural and livestock extension, education and research system is thought to be heavily under resourced, given the scale of the needs they are facing. (IFAD, 2014 and AFC Consultants International, 2015). Given these factors many farmers don't receive agricultural and livestock extension services from the government. (Wissink, 2017)

The private sector, civil society, and international organisations also play an important role in providing extension services to farmers. Besides, there are other sources of information that farmers use to improve their practices, including radio, television, printed materials, peer learning, and, since recently, mobile applications. The extension services of the private sector are currently mostly linked to the sale of pesticides and fertilisers, which are often criticised for advising farmers to use more of their products than actually needed without detailed advice on how to use these products, or for providing no advice at all. General knowledge among farmers on the responsible and effective use of fertilisers and pesticides is deemed very low. Some non-profit actors advise farmers to limit the use of inputs, or help them organise in groups to be able to buy inputs at lower prices. (Wissink, 2017) However, non-profit actors are only active in selected parts of the country. It has been recommended that the government should be better aware of these emerging trends and regulate extension services provided by companies and/or NGOs if needed (AFC Consultants International, 2015), and there to be better cooperation between public, private and non-profit sector in the provision of extension services to farmers (Cho, 2013)

The emerging providers of mobile agricultural applications are thought to be still in an early stage of development, providing rather general advice and market information to farmers, while they are in need of specific advice given their specific circumstances and problems faced.

Remote sensing and geographical information systems (GIS) is used increasingly in a variety of activities related to agriculture, fisheries and natural resources management. GIS is for instance used in support of land titling efforts of farmers' private and communal lands. GIS is also used in at least one project on fisheries governance to demarcated separate inland fishing grounds. GIS is also being used in at least one project for the administration of ecosystem services provided by farmers. However, classical GIS applications are deemed not suitable for the G4AW programme, because it will be difficult to develop them in self-sustaining businesses.

3.2 INSTITUTIONAL CAPACITY TO SUPPORT VIABLE INFORMATION SERVICES

3.2.1 GENERAL INFORMATION SUPPLIERS ACTIVE IN AGRICULTURE DOMAIN

MoALI is the most important ministry in terms of information supply. It acquires information through its extension services and other decentralised staff. However the acquired information is often not digitalised, scattered over

the various departments involved, and therefore requires a more structural central approach of data management and disclosure to other organizations. Within MoALI the following departments are in particularly relevant:

- Department of Agriculture (DoA): Responsible for agricultural extension services
- Department of Agriculture, Land Management and Statistics (DALMS): Responsible for agricultural land registration and agricultural statistics
- Department of Irrigation, Water Resources Utilization and Management: Responsible for government irrigation services

Besides MoALI, MoNREC is important because its role in land tenure related activities, like the OneMap initiative (see also section 4.3). The government of Myanmar, led by MoNREC, with the technical support of the University of Bern and financial support from SDC aims to develop an open access spatial data platform on land-related information functions as an effective basis for transparent analysis of accurate data and accountable land governance and development planning by government and citizens. The initiative was first officially introduced in 2014. Many technical and institutional challenges remain related to the integration of the data of different ministries in this platform, including data from MoALI. MoNREC is also responsible for environmental conservation, which is often in some way linked to agricultural activities.

In general, most Myanmar government entities struggle with poor infrastructure (hardware, software, lack of good access to primary data) and limited capacity of human resources. Data are scattered over different departments and data collection is often not digitalised, causing inefficiencies and delays in information transmission. It is also difficult to find out exactly what data are available. MoALI seems to need a general program to set up an appropriate data system to manage its various information sources and make it available to the rest of the government, and as far as possible to the public. Such an initiative should work together with a general program to modernise and digitalise its decentralised and central office.

Farm insurance against adverse weather events does currently not exist in Myanmar. However, there are regular calls for crop insurance, as a way for farmers to manage their risks. On 22 March 2016 a 'Workshop on Agricultural Insurance in Myanmar' was organised in Nay Pyi Taw by the Consulate of India in collaboration with the former Ministry of Agriculture and Irrigation and Ministry of Finance. The regulatory framework is currently not ready for private operators to offer farm insurance products to farmers. The government seems motivated to make the required changes, but it is not clear what concrete steps have been taken since the workshop. (Consulate of India, 2016) The Myanmar Agricultural Development Bank (MADB), which falls under MoALI, is the biggest government agricultural credit scheme. It reaches substantial numbers of farmers, but also requires substantial reforms to make it a more effective agricultural lender. (World Bank, 2014)

3.2.2 SPECIFIC AGRI-SECTOR INFORMATION SUPPLY AND CURRENT MECHANISMS

As mentioned in section 3.1, besides government extension services, the private sector, civil society, and international organisations also play an important role in providing extension services to farmers. In addition, there are other sources of information that farmers use to improve their practices, including radio, television, printed materials, peer learning, and, since recently, mobile applications.

3.2.3 OTHER SECTORS (AND ROLE OF INFORMATION) IMPORTANT FOR THE AGRICULTURAL SECTOR

Myanmar's telecom sector has developed quickly after the entry of two foreign operators, Qatar's Ooredoo and Norway's Telenor, in the local mobile market, joining the former monopoly operator, Myanmar Post and Telecommunications (MPT). A fourth mobile licence was given in January 2017 to Myanmar National Tele & Communications (MNTC), which will cooperate with Vietnam's Viettel Company and will start services within one year. Myanmar's mobile market has seen very strong growth from 2013 to 2016. Penetration rose from 7% in 2013

to 85% by 2016 with 46 million subscribers. Further strong growth is also expected over the next four years to 2021. By 2018 the market is expected to reach mobile penetration of over 90%. (Harpur, 2016 and Mizzima, 2017) Smartphone adoption was 70% in third quarter of 2016, far above the global average of 49%. Already big parts of Myanmar are served by 3G networks, reaching 85% of the population in the second quarter of 2016. Ooredoo and Telenor have also launched 4G, while MPT is testing the technology. 34% of smartphone users that do not use internet, which points at a lack of awareness or relevant content. (Iji, 2016)

A survey in 2015 found that data services were used only by a third of the people who owned a mobile telephone, and their usage mostly consists of social media and calling applications. People often have a limited understanding of what the 'internet' is, and therefore do not see why it is relevant to them. Many people have negative perceptions of the internet, especially among people with little experience and knowledge of the internet. Women in Myanmar are 29% less likely to own a mobile phone than men. This was explained through the fact that households with limited resources will often choose to provide a mobile phone first to the household members who go out for work or studies, who are more likely to be men. Besides, many women don't have the knowledge or skills to start using data services. For instructions they often rely on men, and especially women in rural areas were therefore less likely to seek support. (Zainudeen et al., 2015)

In the table below the number of subscribers and market share of the three mobile providers is shown.

Table 1 – Mobile subscribers and market share of Myanmar's mobile providers

Mobile provider	Subscribers (million)	Market Share
MPT	22	44%
Telenor	19	37%
Ooredoo	9.6	19%
Total	51	-

Source: GSMA Intelligence according to Consult-Myanmar, 2017

4 NEEDS ASSESSMENT OF IMPROVED ICT & INFORMATION SUPPLY IN THE AGRI SECTOR

In this section, an inventory of specific needs and problems in the information supply (and demand) in the Myanmar Agri sector is provided. The most important local stakeholders represented in the identified problem domains are selected.

4.1 NEEDS ASSESSMENT WITH A FOCUS ON POTENTIAL USE OF SPATIALLY BASED INFORMATION SERVICES

In Myanmar there is a strong need for agricultural information and advisory services that are tailored to the specific circumstances faced by a farmer. In particular advise on the use of fertilisers taking into consideration the local soil characteristics and advise on the use of pesticides, taking into consideration local meteorological information and disease pressure in the area. In theory could localised meteorological information on evaporation be useful for tailored advice on irrigation, but it is thought that the majority of the irrigation techniques used in Myanmar, often controlled by the government, don't allow for precise irrigation at a sufficient scale in terms of potentially interested farmers. General weather forecasting services are already being offered to farmers with smartphones, but it is not known how many farmers are using this information, possibly hampered by lack of awareness and technical and language skills. More localised weather forecasting services would probably be useful to enable farmers to make better assessments for all kinds of decisions, like when to sow, when to spray, and when to harvest. Another possible use of satellite information could be for harvest forecasting of mayor crops, in particular rice, by the government or the private sector supporting making decisions in logistics and trade. There is certainly scope for improvement of the supply of market information to farmers, but there is no clear need to use satellite information other than GIS for that, and hence would fall outside the scope of G4AW.

4.2 PUBLIC AND PRIVATE PROBLEM STAKEHOLDERS AND INTERNATIONAL ORGANISATIONS IN THE DOMAIN OF G4AW

In the table below an overview is given of the main stakeholder in the domain of G4AW in Myanmar. In addition, relevant organisations can be found through the directory on the G4AW website: <http://g4aw.spaceoffice.nl/en/About-G4AW/G4AW-Directory/Organisations/> On the website also a list of all existing G4AW projects and the involved partners is available (<http://g4aw.spaceoffice.nl/files/files/G4AW/G4AW%20Details%20of%20projects%20LR%2024082016.pdf>), as well as more detailed information on the different projects.

Table 2 – Overview of the main stakeholders (by category)

Organization	Description	Website
Government		
Ministry of Agriculture, Livestock and Irrigation (MoALI)	MoALI is the ministry responsible for agriculture (including irrigation), livestock, fisheries, rural development and cooperatives. MoALI is doing some work on remote sensing in collaboration with FAO and JICA, but it is thought that this is mainly focusing on obtaining statistical information in terms of surfaces of crops grown per area. However, reportedly in 2005 a pilot project was started in the delta on crop yield estimation through remote sensing. (Naing, 2011)	-
MoALI, Irrigation Training Centre (ITC)	ITC is interested to make more use of remote sensing technology	-
Ministry of Natural Resources and Environmental Conservation (MoNREC)	MoNREC is the ministry responsible for forestry, environmental conservation and mines. It also plays an important role in land tenure related issues.	www.moecaf.gov.mm/

Ministry of Transport (MoT), Department of Meteorology and Hydrology (DMH)	DMH has considerable infrastructure for weather forecasting, which has been upgraded in years with support from Japan. Weather forecasts are available for mobile applications to use. Through the Farmer Channel also certain weather forecasts are disseminated.	www.dmh.gov.mm/
Ministry of Planning and Finance (MoPF), Department of Financial Regulation	MoPF responsible for financial regulations, and thus would be needed to create a conducive regulatory environment for index based crop insurance and index based insurance of agricultural credit schemes	www.mopf.gov.mm/index.php?lang=en
International Organisations		
FAO	The Food and Agriculture Organization of the United Nations has many activities in agriculture, including remote sensing (see info in section 4.3 on FAO GeoNetwork). FAO is supporting MoALI in its work on remote sensing.	http://www.fao.org/geonetwork/srv/en/main.home
IFAD	IFAD has agricultural projects in and in Southern Shan and Kayen State, and in Nay Pyi Taw, which also focuses on agricultural advisory services	https://operations.ifad.org/web/operations/country/home/tags/myanmar
WFP	WFP has activities in different parts of Myanmar, in particular the areas that have suffered from conflict or natural disasters	https://www.wfp.org/countries/myanmar
ADB	ADB is supporting the Department of Rural Development of MoALI with a Community Driven Development project	https://www.adb.org/countries/myanmar/main
World Bank	The World Bank is supporting the development of a Hydroinformatics Centre HIC as part of its Ayeyarwady Integrated River Basin Management (AIR BM) project. Arcadis and WUR are involved in parts of AIR BM project as well. The World Bank also has an 'Agricultural Development Support Project' in Myanmar, second component of which is 'to enhance MOAI technology development and farm advisory services at target townships which host selected irrigation schemes to improve farmer crop choices and increase farm productivity. It will support quality seed production, soil nutrition management, integrated pest management, agricultural extension services, and farm mechanization.'	http://projects.worldbank.org/P146482?lang=en http://www.gwp.org/Global/Events/Myanmar/NiNi%20Keynote%20HLRTmeeting%2024May2016.pdf http://projects.worldbank.org/P147629?lang=en
OCHA/MIMU	See section 4.3	www.themimu.info
IWMI	IWMI is setting up a database of water related spatial information in collaboration with Delft University and the Myanmar government	http://www.iwmi.cgiar.org/regions/asia/southeast-asia/myanmar/projects/
Private sector		
Myanmar Rice Federation (MRF) and its company Myanmar Agribusiness Public Corporation Limited (MAPCO)	MRF is the association of rice traders, which is a member of UMFCCI. MAPCO is a company that falls under MRF, and has set up 'Agribusiness Service Centers' (ASCs) in different parts of the country. Linked to that MRF/MAPCO is also planning to develop a mobile application for farmers.	http://myanmarricefederation.org/ http://www.mapco.com.mm/
Myanmar Pulses, Beans & Sesame Seeds Merchants Association (MPBSMA)	MPBSMA is also member of UMFCCI. Pulses, beans and sesame are important export products, especially in the Dry Zone.	http://www.mpbsma.org/
Myanmar Fertilizer, Seed and Pesticide Entrepreneurs Association (MFSPEA)	MFSPEA is also member of UMFCCI	https://en-gb.facebook.com/MFSPEA/
Awba	Awba is a company selling agricultural inputs to farmers, in particular fertilisers and pesticides, but also seeds and machinery. Awba has developed a mobile applications for its farmer customers. It is also involved in the crop insurance project financed by Syngenta Foundation (see 4.3). Awba has also a preferred partnership with SoilCares.	http://www.awba-group.com/
Arcadis	Arcadis is developing the water master planning for the integrated delta strategy.	https://www.arcadis.com/en/global/

Fresh Studios	Fresh Studio was founded in 2006 as a foreign invested Vietnamese company. The main focus of Fresh Studio is value chain analysis and development on various agricultural products (both vegetables as well as meat). One important aspect of the value chain development is production through contract farming arrangements with smallholders. It is since 2015 active in Myanmar, especially in the poultry and corn sector.	http://www.freshstudio.vn/
East West Seeds	East West Seeds is a Dutch company focusing on the supply of seeds to smallholder farmer. It is active in selected countries in Africa and Asia, including Myanmar. In Indonesia it also participates in an existing G4AW project.	http://www.eastwestseed.com/
SoilCares	SoilCares is a Dutch company that has developed a Soil Scanner that enables a realtime analysis of soil for macro nutrient contents, the pH, electrical conductivity, soil temperature and the organic matter level. In Myanmar SoilCares has a preferred partnership with Awba.	http://www.soilcares.com/en
Farmers Organisations	There are many farmers' organisations active in Myanmar, and there are different kinds of farmers' organisation. Unfortunately many of these organisations are currently not very well organised internally and amongst each other and in associations of farmers organisations. Hence, there are significant challenges with the representative representation of the voices of smallholder farmers at the national level. (FSWG et al., 2015) See the link besides to a report by FSWG and GRET for more information.	http://www.myanmarfswg.org/sites/myanmarfswg.org/files/fswg-gret_-_myanmar_fo_mapping_study_-_dec_2015_2.pdf
Local and international NGOs	There are numerous local and international NGOs active in Myanmar in the agricultural sector, too many to list all here, therefore just a small selection of some relevant organisations is given.	
FSWG	FSWG is a network of both local and international NGO focused on agriculture, rural development and food security.	http://www.myanmarfswg.org/
Cordaid	Cordaid is a NGO from the Netherlands active in Myanmar, including in the agricultural sector, with projects in different parts of the country.	www.cordaid.org/en
ICCO	ICCO Cooperation is a NGO from the Netherlands, which is active in Myanmar since 2002. ICCO works on agricultural development with their CSO, business and government partners, in line with their approaches on Markets for the Poor (M4P) and Value Chain Development (VCD). Their focus in Myanmar is on the pulses, beans and oilseeds sector. In Indonesia and Vietnam ICCO is the lead implementer of the G4AW projects SMARTseeds and GREENcoffee.	http://www.icco-cooperation.org/en/countries/myanmar
SNV	SNV is an NGO from the Netherlands, which is active in Myanmar since recently as part of an agricultural value chain project in Kayen State. SNV is also partner in an existing G4AW project in Bangladesh.	http://www.snv.org/
Mobile providers		
MPT	MPT is the state owned and largest mobile telephone company of Myanmar (see also section 3.2.3) As far as known MPT currently does not provide specific farmer applications	http://mpt.com.mm/en/home/mobile-services/portal-and-apps/ http://lotayamm.com/
Telenor	As far as known Telenor currently does not provide specific farmer applications in Myanmar, although it does so in other countries, including Thailand.	https://www.telenor.com/sustainability/initiatives-worldwide/using-mobile-to-improve-farming-skills/ https://www.telenor.com/sustainability/initiatives-worldwide/empowering-thai-farmers-through-agri-based-services/

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Ooredoo	Ooredoo Myanmar developed an android mobile app that is delivering agriculture related information along with weather update to farmers in Myanmar. Gradually Ooredoo will offer more varieties of content in terms of number of crops, market place, market price, financial literacy guidance and financial services.	http://www.ooredoo.com.mm/en/Personal/Services/SitePyo.aspx http://www.gsma.com/mobilefordevelopment/grantee/ooredoo-myanmar
Farmer application providers		
Impact Terra	Impact Terra aims to connect farmers and stakeholders through smartphones. The social enterprise has developed and operates the Shwe Thee Nhan Facebook page and Android app. Its farming community mid February consists of 100,000 people and grows with about 10,000 per day. Impact Terra aims to integrate precision farming tools and data (a.o. geodata) to improve its farmer advisory services. The social enterprise is part of the VEGImpact and VEGCap programs (see section 4.3)	https://www.impactterra.com/ www.facebook.com/shwetheehan
Green Way	Green Way / Greenovator has developed a mobile application that provided technical advice, weather information, and market information to farmers. Green Way has currently around 28,000 users.	http://www.mmgreenovator.com/ , http://www.greenwaymyanmar.org/
Miaki	Miaki is company that developed applications for farmers in Bangladesh. In Myanmar it is working for Ooredoo. See under Ooredoo for more info.	http://miakivas.com/
Blue Ocean	Blue Ocean is not a specific mobile application for farmers. In collaboration with the Ministry of Information it provides weather forecasts and forecast information of disasters such as floods, droughts or storms, which can also be useful for farmers and fishermen.	http://www.blueoceanmgt.com/ https://www.unglobalcompact.org/system/attachments/cop_2016/322411/original/Communication_on_Progress_2016.pdf?1475649445
Satellite information providers ¹		
Mandalay Technologies	Mandalay Technology (previously known as Myanmar Credent Technology) provides geospatial technological solutions and services including surveying, GIS/mapping, remote sensing, geotechnical investigation, hydrological and marine survey, and related trainings.	http://www.mandalay-technology.com/
SUNTAC	Suntac Technologies, another Myanmar company, provides services in the fields of civil and mechanical engineering, surveying, aerial mapping, computer technology, remote sensing and GIS technology, and geology. This includes experience with projects in the fields of agricultural development, dams and irrigation systems; and the development of a national spatial database.	http://www.suntactechnologies.com/b.htm
SarVision	SarVision is a spin-off company from Wageningen University and Research (WUR) based in the Netherlands. It pioneers the operational application of systematic satellite and airborne monitoring and mapping systems for environmental and natural resource management. SarVision is a partner in a number of existing G4AW projects.	http://sarvision.nl/
Terrasphere	TerraSphere is also a Dutch company that offers geo-ICT solutions through mapping and GIS analysis. By combining competences in the fields of satellite UAV (Unmanned Aerial Vehicle), remote sensing and GIS analysis they are able to extract information from earth observation imagery. TerraSphere is specialized in the domains of precision agriculture, forest mapping & wetland monitoring. Terrasphere	http://www.terrasphere.nl/

¹ The non-Myanmar companies listed under this section are not yet active in Myanmar, but are still considered to be relevant for the Myanmar situation as possible partners for future G4AW projects.

	is also a partner in two existing G4AW projects in Bangladesh and Indonesia.	
Satelligence	Satelligence is another Dutch company that is a spin-off from WUR. They work on agriculture, as well as land use biomass, and water. In the field of agriculture, they work on agricultural crop performance monitoring e.g. maps and derived statistics of cultivated area, crop type, area and condition, crop growth stages and phenology, biomass and yield, crop damage, and changes therein. Satelligence is a partner in a number of existing G4AW projects.	http://www.satelligence.com/
Donors/bilateral projects		
SDC's OneMap project	See section 4.3	https://www.facebook.com/OneMap-Myanmar-1048189161886851/
Norway's IWRM project	The long term development goal of the project "IWRM - Institutional Building and Training" which is a collaboration between NIVA (Norwegian Institute for Water Research) and MoNREC is to contribute significantly to the implementation of well-functioning Integrated Water Resources Management at the national level in Myanmar. The Department of Irrigation, Water Resources Utilization and Management (DIWRUM) under the Ministry of Agriculture, Livestock and Irrigation and the Directorate of Water Resources and Improvement of River Systems (DWIR) under the Ministry of Transport are members of the steering group of the project together with MoECaF.2 As part of the project they are also planning to set up a database for water quality.	http://www.forestdepartment.gov.mn/news/23476
KOICA	KOICA is developing the Master Plan for Agricultural Planning in the Delta	http://www.koica.go.kr/english/main.html https://www.facebook.com/koica.myanmar/
JICA	JICA is supporting MoALI in its work on remote sensing.	https://www.jica.go.jp/myanmar/english/
Foreign universities		
Delft University of Technology	Delft University of Technology is setting up a database of water related spatial information in collaboration with Delft University and the Myanmar government. Is also interested in combining remote sensing, models and soil data.	http://www.tudelft.nl/en/
Wageningen University and Research (WUR)	Agricultural university and research center from the Netherlands, which is involved in a number of project in Myanmar, mostly financed by the Dutch government. WUR is the main implementer of the VegImpact and VegCAP projects (see more info under 4.3). WUR is also a partner in a number of existing G4AW projects, including in Bangladesh and Indonesia	http://www.wur.nl/en.htm

Source: Various sources, including indicated websites

4.3 ONGOING G4AW RELEVANT ACTIVITIES AND/OR PROJECTS IN MYANMAR

VEGCAP and VEGImpact

VEGCAP can be seen as the follow-up project of the VEGImpact pilot project. The purpose of the VEGCAP project is to develop a vegetable farmer knowledge network with the ambition to come to an outreach of 250,000 farmers who have access to practical knowledge and information on the basics of sustainable vegetable production and increased profitability. The project will also make use of the Pesticide Selection Tool developed by WUR. Both projects are financed by the Dutch government (RVO). (Source: Vegcap project proposal)

² <http://www.niva.no/myanmar>

OneMap Myanmar

OneMap is an initiative financed by SDC, but closely linked and governed by the Myanmar government, with the main entity being MoNREC. Its objective is to develop an open access spatial data platform on land-related information functions as an effective basis for transparent analysis of accurate data and accountable land governance and development planning by government and citizens.³

OCHA/MIMU

The Myanmar Information Management Unit / MIMU is a service to the UN Country Team and Humanitarian Country Team, under the management of the UN Resident and Humanitarian Coordinator. Its purpose is to improve the capacity for analysis and decision making by a wide variety of stakeholders - including the United Nations, the Humanitarian Country Team, non-governmental organizations, donors and other actors, both inside and outside of Myanmar, through strengthening the coordination, collection, processing, analysis and dissemination of information.⁴

SoilCares Scanner

SoilCares, a Dutch company with close links to WUR is in the process of preparing the introduction of the SoilCares Scanner to Myanmar. The SoilCares Scanner can measure the amount of Nitrogen, Phosphorus and Potassium available in the soil and determine the pH, electrical conductivity and the soil temperature and the organic matter level.⁵ The scanner needs to link with a database of other soil samples taken in a country to be able to give precise measurements.

FAO GeoNetwork

The FAO GeoNetwork provides access to interactive maps, satellite imagery and related spatial databases maintained by FAO and its partners. Its purpose is to improve access to and integrated use of spatial data and information. Through its website the FAO GeoNetwork facilitates multidisciplinary approaches to sustainable development and supports decision making in agriculture, forestry, fisheries and food security.⁶

Syngenta/MAPCO crop insurance project

Myanmar Agribusiness Public Cooperation (MAPCO) and the Syngenta Foundation for Sustainable Agriculture (SFSA) are carrying out a survey to collect the required data for the establishment of a crop insurance system.⁷

SERVIR Mekong

'SERVIR brings NASA's scientific and technical know-how to help developing countries use information provided by Earth observing satellites and geospatial technologies for managing climate risks and land use. SERVIR-Mekong will promote the use of publicly available satellite imagery and related geospatial decision-support tools/products to help key stakeholders and decision makers in Burma, Cambodia, Laos, Thailand, and Vietnam better predict and manage floods and other natural disasters, improve agricultural risk management, manage land-use more sustainably, and help governments and communities increase resilience to the negative effects of climate change. Funded by USAID, with scientific and technical support from NASA, SERVIR-Mekong is being implemented by the Asian Disaster Preparedness Center (ADPC) and consortium partners.⁸

4.4 REFERENCES TO PUBLIC DOMAIN PUBLICATIONS

Below a few selected references to relevant documents and websites are given. Under the 'References' chapter also web links are given to many of the literature sources referred to throughout the text.

³ http://themimu.info/sites/themimu.info/files/suzeeyar-presentations/P03_Dr_MyatSuMon_OneMap_Myanmar_EN.pdf

⁴ <http://www.themimu.info/about-us>

⁵ <http://www.soilcares.com/en/products/scanner/>

⁶ <http://www.fao.org/geonetwork/srv/en/main.home#>

⁷ <http://www.myitmakhamedia.info/survey-aims-to-gather-necessary-data-to-kick-start-crop-insurance-system/>

⁸ <https://servirglobal.net/Global/Articles/Article/1367>

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- Reports linked to the agriculture programme of the Embassy of the Kingdom of the Netherlands (EKN): <https://drive.google.com/drive/folders/0B0HBp19u8LNXMBVdWISRjgyd00>
- Article on use of remote sensing technology in Myanmar by Zaw Naing (currently Managing Director of Mandalay Technology): http://www.academia.edu/13779269/Progress_of_GIS_and_Remote_Sensing_Applications_in_Agricultural_and_Environmental_sectors_in_Myanmar

5 INVENTORY OF POTENTIAL (CHAIN) SOLUTIONS DIRECTIONS USING GEO-ICT IN LOCAL AGRICULTURE ISSUES

5.1 BASE SOLUTION DIRECTIONS IN MYANMAR TAILORED TO LOCAL AGRICULTURAL PRACTICES

5.1.1 ACTUAL AGRI-SPATIAL INFORMATION SERVICES

As discussed in the various previous sections Myanmar's agriculture is facing multiple challenges. After years of isolation it is coming from a low level of technology, but developing fast with wide and expanding mobile coverage and high smart phone penetration. Possible economically sustainable solution directions using geodata seem to lie especially in the provision of location specific agricultural advisory services. However, such advisory services would have a better chance of being adopted if they are embedded in a wider package of (non-geodata based) agricultural advisory services, because there is still a big scope for improvements of agricultural practices through less sophisticated advisory services. Mobile farmer applications that have already been developed by various entities in Myanmar seem to be the most feasible medium to get any geodata based agricultural advisory services to farmers in an efficient way. Such services could include more accurate and localised weather information, location specific advice on the use of agricultural inputs, in particular fertilisers and pesticides, based on localised weather information and/or soil information.

More detailed harvest forecasting based on geodata would be relevant for Myanmar, but would not directly benefit smallholder farmers. However, the data could be useful for rice traders and the government in its efforts to manage the rice markets. In case a private (group of) rice traders would like to submit a proposal that would include such forecasting, they would have to demonstrate clearly how the potential benefits would be shared with smallholder farmers. Probably such an activity would have to be part of a wider proposal that also includes other geodata based activities that benefit smallholder farmers in a more direct way.

5.1.2 FARM INSURANCE AND RISK PREVENTION STRATEGIES

Other possible applications of geodata for smallholder farmers could be the use of index based data for crop insurance and the insurance of credit schemes (like done in Ethiopia⁹). However, apart from the considerable technical challenges, the institutional framework for crop insurance schemes seems not ready at the moment. But in case there is a serious push during 2017 from the government to create a conducive institutional framework for index based crop insurance, and there are serious parties interested in offering such services, it could be feasible as well, as any project contract are not likely to be signed before the beginning of 2018. One of the current G4AW projects in Indonesia¹⁰, or G4AW projects in Africa focusing on crop insurance, could possibly serve as models in that case.

Index based insurance of agricultural credit schemes seems not likely in Myanmar. The main government agricultural credit scheme provided by the Myanmar Agricultural Development Bank faces many more basic challenges that would have to be resolved first to make MADB an efficient organisation that is ready for more complicated endeavours.

⁹ For more info see: <http://g4aw.spaceoffice.nl/en/Projects/G4AW-projects/64/Geodata-for-Innovative-Agricultural-Credit-Insurance-Schemes-GIACIS.html>

¹⁰ For more info see: <http://g4aw.spaceoffice.nl/en/Projects/G4AW-projects/65/Geodata-for-upgrading-smallholders-farming-systems-in-Indonesia-G4INDO.html>

5.2 DIFFERENTIATION OF SPATIAL SOLUTIONS TAILORED TO AGRICULTURAL PRACTICES/SECTOR IN MYANMAR

Differentiation will follow after the matchmaking missions and meeting with specific stakeholders in Myanmar.

6 RECOMMENDATIONS FOR MATCHMAKING/MISSIONS

It is recommended that any emerging partnerships are assessed on their completeness, user engagement and business orientation. The partnerships need to represent a set of different organisations that together are able to ensure that the whole information chain is covered well, from the obtainment of geodata, analysis, and efficient transfer of easily actionable information to farmers. If needed, emerging partnerships should be provided with contact details of possible additional partners that could possibly fill any identified gaps. Depending on the number of partnerships emerging in Myanmar and their assessed ability to develop a high quality proposal, possibly consideration needs to be given to suggesting certain partnerships to combine to stand a better chance.

For the workshop on March 16 also relevant organisations from the Netherlands should be invited, especially those that focus on the beginning of the information chain, obtaining and analysing geodata. Such organisations seem to be in short supply within Myanmar itself.

It is advised to subscribe to the

- G4AW directory: <http://g4aw.spaceoffice.nl/en/About-G4AW/G4AW-Directory/Organisations/>
- G4AW mailing list: <http://g4aw.spaceoffice.nl/en/About-G4AW/Subscribe/>
- G4AW LinkedIn Group: <https://www.linkedin.com/groups/8509495>

7 REFERENCES

- APCTT, CAPSA and NAG, 2016, Policies, Institutions and Processes to Support Value Chains for Seed Development for Pulses, Legumes and Oil Crops in the Dry Zone (http://www.satnetasia.org/sites/default/files/apctt_pip_case_study.pdf)
- Becker, Aaron M., Thein, San, Kham, Cin Tham, and Mark, Channsitha, 2015, LIFT Uplands Programme: Scoping Assessment Report, LIFT (http://www.lift-fund.org/sites/lift-fund.org/files/uploads/Uplands/LIFT%20Upland%20Programme%20Scoping%20Report_July2015_WM%20JH%202%20July.pdf)
- Cho K. M. and Boland H, 2003, Searching Institutional Linkages for Implementation of a Participatory Extension Approach in Myanmar. In: Proceedings of the 19th annual Conference of Association for International Agricultural Extension and Education (AIAEE), North Carolina, Raleigh, United States of America, p 135-147 (<https://www.aiaee.org/attachments/article/1224/Cho135.pdf>)
- Cho, K. M., 2013, Current Situation and Future Opportunities in Agricultural Education, Research and Extension in Myanmar, MSU and MDRI-CESD (http://fsg.afre.msu.edu/Myanmar/myanmar_background_paper_5_july_2013.pdf)
- Consulate of India, BASIX, Tropical Bio Technology and WRL, 2016, Workshop on Agricultural Insurance in Myanmar - Proceedings of the Workshop
- Consult-Myanmar, 13/01/2017, Viettel entering mature Myanmar mobile market (Retrieved from consult-myanmar.com on 20 January 2017) (<https://consult-myanmar.com/2017/01/13/viettel-entering-mature-myanmar-mobile-market/>)
- FAO, 2014, Myanmar Dry Zone Development Programme - Scoping Report (http://www.lift-fund.org/sites/lift-fund.org/files/uploads/Dry_Zone/Dry-Zone-Scoping-Report-Final-pdf.pdf)
- Ferguson, Jo-Anne, 2013, Consultancy on Co-operative Systems in Myanmar, LIFT ([http://www.lift-fund.org/sites/lift-fund.org/files/publication/Consultancy-on-Cooperative-Systems_English%20\(Sept%202013\).pdf](http://www.lift-fund.org/sites/lift-fund.org/files/publication/Consultancy-on-Cooperative-Systems_English%20(Sept%202013).pdf))
- FMI, 2016, FMI Annual Report FY 2015-2016 (Retrieved from <http://fmi.com.mm/> on 18/01/2017) (<http://fmi.com.mm/annual-report-2016/#chairman>)
- FSWG, 2014, An Analytical Study on Food Safety Issues in Different Stages of Vegetable Production from Farm to Table - Briefing Paper of Evidence
- FSWG and GRET, 2015, The Emergence of Farmers' Organizations in Myanmar, LIFT and AFD (http://www.myanmarfswg.org/sites/myanmarfswg.org/files/fswg-gret_-_myanmar_fo_mapping_study_-_dec_2015_2.pdf)
- Harpur, Phil, 2016, Myanmar (Burma) - Telecoms, Mobile, Broadband and Digital Media - Statistics and Analyses (Retrieved on 20/01/2017 from www.budde.com.au) (<https://www.budde.com.au/Research/Myanmar-Burma-Telecoms-Mobile-Broadband-and-Digital-Media-Statistics-and-Analyses>)
- IFAD, 2014, Fostering Agricultural Revitalization in Myanmar (FARM) - Final project design report (<https://www.ifad.org/documents/10180/5b5164c9-c172-45ce-ac3d-1421c3992ad0>)
- Iji, Matthew, 2016, Data monetisation the key as Myanmar exits growth phase, GSMA Intelligence (<https://www.gsmaintelligence.com/research/?file=2f473175fcd069b3bc0899b652c7bc58&download>)

Irrawaddy, 9/9/2015, Tun Lwin: 'Each Year There is Drought in the Dry Zone, Flooding in the Delta' (Retrieved on 03/02/2017 from www.irrawaddy.com) (<http://www.irrawaddy.com/in-person/interview/tun-lwin-each-year-there-is-drought-in-the-dry-zone-flooding-in-the-delta.html>)

2013, LIFT, Household Survey 2013 (http://www.lift-fund.org/sites/lift-fund.org/files/publication/LIFT_HH_Survey_2013_0.pdf)

Mizzima, 13/01/2017, Fourth telecom operator in Myanmar to begin telecom services within one year (<http://www.mizzima.com/business-domestic/fourth-telecom-operator-myanmar-begin-telecom-services-within-one-year>)

MoALI, 2015, 2015 Myanmar Agriculture in Brief

MoALI, 2016a, Second Short Term Five Year Agriculture Policies and Plans

MoALI, 2016b, Agricultural Development Strategy and Investment Plan (Draft - December 2016)

MoECAf, MoT and UNEP, 2012, Myanmar's National Adaptation Programme of Action (NAPA) to Climate Change (<http://unfccc.int/resource/docs/napa/mmr01.pdf>)

MoNREC, 2016, Myanmar Climate Change Strategy and Action Plan (Draft - 11 July 2016) (http://myanmarccalliance.org/mcca/wp-content/uploads/2016/07/MCCA-Strategy_ActionPlan_11July2016V1.pdf)

Naing, Zaw, 2011, Progress of GIS and Remote Sensing Applications in Agricultural and Environmental sectors in Myanmar (http://www.academia.edu/13779269/Progress_of_GIS_and_Remote_Sensing_Applications_in_Agricultural_and_Environmental_sectors_in_Myanmar)

NESAC, 2016, A New Vision for Myanmar's Agricultural Development - From Rice Bowl to Food Basket: Three Pillars for Modernizing Myanmar's Agricultural and Food Sector (<http://www.lift-fund.org/sites/lift-fund.org/files/publication/Myanmar%20Agricultural%20Reform%20White%20Paper.pdf>)

Peeters, Floor, Van Meggelen, Jos, and Schepers, Huub, 2015, Crop protection and pesticide risk assessment Myanmar - Towards sustainable agricultural production and export of high value crops (<http://edepot.wur.nl/352659>)

Roelofsen, Paul, Aung, Min, and Yu, Khin Hnin, 2015, Chemical and Organic Fertilizer Knowledge, Concerns and Market in Relation to Interests of Small Holder Farmers in Myanmar, FSWG

Slagle, John T., 2014, Climate change in Myanmar: impacts and adaptation (http://calhoun.nps.edu/bitstream/handle/10945/44672/14Dec_Slagle_John.pdf?sequence=1)

UNDP, 2011, Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar - Project/Programme Proposal (http://www.adaptation-fund.org/wp-content/uploads/2015/01/RESUBMISSION_AF_Myanmar%20-%20Full%20proposal_11Feb2014.pdf)

Wissink, Thijs, 2017, Promoting Participatory Decision-making for Better Policy Design and Implementation for Sustainable Agriculture in Myanmar's Dry Zone (Draft), UNESCAP-CAPSA

World Bank, 2014, Myanmar Agricultural Development Bank: Initial Assessment and Restructuring Options, LIFT (http://www.lift-fund.org/files/publication/LIFT-WB_MADB_Initial_Assessment_Final_0.pdf)

Zainudeen, A and Galpaya, H, 2015, Mobile phones, internet, and gender in Myanmar, GSMA and LIRNasia (<http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/02/Mobile-phones-internet-and-gender-in-Myanmar.pdf>)