



Final Technical Report - Integrated Seed Sector Development Myanmar: 2017-2021

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Reporting Period	2017-2021	Reporting Institution	Wageningen University & Research
Reporting Manager	Abishkar Subedi ISSD Myanmar programme leader	Date	31 December 2021

1 Key Project Data

Project Title	Integrated Seed Sector Development Myanmar: Developing a Vibrant Public-Private Seed System for Rice, Oilseeds and Legumes in the Dry Zone (ISSD Myanmar)					
Duration of project	Current phase	2017-2021	Project launch	1/1/2017	Closing date	30/06/2021
Budget	Budget for reporting period	€ 1,499,639	Overall budget	€ 1,499,639	Overall contribution by	

2 Executive Summary

The Integrated Seed Sector Development (ISSD) Myanmar programme has three components, which correspond with its three outcome areas. The first component is seed sector coordination, with the outcome of improving seed sector coordination; the second is early generation seed (EGS) production, with the outcome of increased business performance of EGS-producing seed farms; and the third is seed business development, with the outcome of increased local availability and uptake of quality seed at affordable prices by smallholder farmers. The main results of the period 2017-2021 for the three components are presented below.

Improved seed sector coordination

- The programme organized seven **National Seed Sector Platform meetings** that brought together the main seed sector stakeholders from the public sector, the private sector, development partners, and NGOs. The main objectives of these biannual seed sector platform meetings were to better align government and development partners' activities, and to prioritize intervention areas in the enabling environment including policy and regulatory issues. An overview of the seven meetings is provided below.
 1. *Launch of the seed sector action agenda (2017)*: The meeting presented the seed sector road map and action agenda and aimed to divide tasks between development partners on the agenda items. As a result of the meeting a monitoring framework and platform secretariat were established.
 2. *Seed regulatory reform agenda (2017)*: Together with International Finance Corporation -World Bank Group (IFC-WBG) a national meeting was held to prioritize those regulatory topics that need reform. A prioritization of 12 topics was made which were then also addressed by the National Seed Committee.
 3. *Public-private collaboration (2018)*: This meeting addressed public-private partnerships with the Department of Agricultural Research (DAR); best practices in risk-based management; updates on recent seed regulatory changes; and the application process for plant breeder's rights (PBR) in Myanmar.
 4. *Global standards & commitments (2018)*: The meeting was organized in collaboration with the World Seed Partnership, consisting of the International Seed Federation (ISF); the International Seed Testing Association (ISTA); the Organisation for Economic Co-operation and Development (OECD); the International Union for the Protection of New Varieties of Plants (UPOV) and the World Farmers' Organisation (WFO). The focus of the meeting was on international standards for seed production and how Myanmar can comply with these. After the meeting the central seed laboratory of Myanmar started the process of ISTA accreditation.
 5. *Alternative seed quality assurance systems (2019)*: The platform discussed three quality assurance systems: truthfully labelled seed; quality declared seed; and the participatory guarantee system. The platform concluded that the participatory guarantee system is the most suitable for Myanmar.
 6. *Developing a national seed investment plan for Myanmar (2019)*: This meeting was organized together with the Syngenta Foundation. The Department of Agriculture (DOA) and stakeholders agreed to develop the concept of 'Myanmar Seed Valley' in the Myanmar Dry Zone.
 7. *A national Covid-19 response for the seed sector (2020)*: The meeting discussed the rapid assessment report of impact of Covid-19 on Myanmar's seed sector. More information is available at <https://issdmyanmar.org/2020/06/04/7th-national-seed-sector-platform-meeting-in-the-air/>

Attendance of all meetings was good at each of the meetings (except the online meeting in 2020), with more than 70 high-level representatives from the public and private sector as well as development partners, and with good ownership by the DOA Seed Division. It was the aim that the DOA and the Myanmar Seed Association (MSA) would take over the organization of the biannual seed sector platform meetings; however, because of Covid and the current political situation this was not possible.

- One of the main priorities under the seed sector coordination component was the establishment of a strong private sector association, the **Myanmar Seed Association (MSA)**. The subsequent steps to establish this association are provided below.
 - At the first platform meeting in 2017 the draft statutes of the MSA were discussed, including Plantum (the Dutch umbrella organization for the plant propagation material sector).
 - During the second half of 2017 the MSA (under establishment) finalized its application to the Directorate of Investment and Company Administration (DICA). At the time, DICA requested feedback from the Ministry of Agriculture, Livestock and Irrigation (MOALI) on the composition and focus/scope of the association.
 - After some back-and-forth between MOALI, DICA and the association, some adjustments were made, and the association was officially established in August 2019.
 - From August 2019 onwards, ISSD Myanmar supported the MSA in recruiting an experienced executive secretary, organizing activities for the members (a newsletter and biannual events), and developing a 4-year strategic plan (2020-2023). The strategic plan includes activities to expand services to members and have a more regular and structured dialogue with MOALI government officials.
 - At the moment the MSA has monthly executive committee meetings and is building a partnership with the Asia Pacific Seed Association (APSA).
- Another activity under the seed sector coordination component was the development of several key **technical publications** that can guide seed sector transformation. Below we present the most important.
 - Dry Zone seed demand assessment (2019): Together with Michigan State university and the International Food Policy Research Institute (IFPRI) we undertook a seed demand assessment study for the Dry Zone. The study was implemented in six townships of the Dry Zone, interviewing 1,383 farming households growing rice, pulses, and oilseeds. Key results of the study were shared with seed sector stakeholders in the fourth national seed platform meeting in Nay Pyi Taw. The study provides baseline information on the use of improved varieties by farmers, farmers' sources for new varieties and seed, variety and seed replacement rates, and farmers' willingness to pay for improved varieties and quality seed. The main report can be found here:
<https://www.canr.msu.edu/fsp/publications/research-papers/RP-179.pdf>
 - Business opportunities report: investing in Myanmar's seed sector (2019): We also developed a report to assist domestic and foreign companies to invest in Myanmar's seed sector. The report specifically focused on commercial seed crops like hybrid maize, sunflower, potato, and vegetables. The study further looked at business opportunities for seed production, seed sales and seed-related services. https://issdmyanmar.files.wordpress.com/2019/05/bor_issd_ver1_corr1.pdf
 - Rapid assessment of Covid-19 response (2020): ISSD Myanmar, together with the DOA, undertook a rapid assessment of Covid-19's impact on the seed sector in April 2020. A survey was implemented under 36 informants from 23 organizations and results were validated through three panel discussions with 20 experts. Four alerts were identified: measures reduced the mobility of farmers and seed entrepreneurs, and thereby reduced farmers' access to quality seed; measures affected regulatory functions in seed import, variety release, and registration; measures affected the affordability of quality seed for farmers; and measures hampered the production and supply of early generation seed (EGS). The process supported the Myanmar government in developing a Covid-19 economic recovery plan for the seed sector. The seed alert document was published in May 2020 and can be accessed through this link
<https://issdmyanmar.files.wordpress.com/2020/06/Covid-19-seed-alert01-myanmar.pdf>
 - Furthermore, we carried out studies on quality seed trials to generate field evidence on the additional yield farmers gain in the Dry Zone by using quality seed of improved varieties. As such, we completed three separate studies on quality seed trials by establishing a total of 144 trials in Mandalay, Sagaing and Yezin. The study found that seed produced by seed farms performed well in the farmer trials. Yields of these seeds were, respectively, 25.8%, 32.8% and 21.7% higher for rice, green gram, and sesame than for farmer saved seed. In addition, seed produced by seed companies also had higher yields than farmer saved seed. For the trials undertaken at farmer fields the difference for rice was

26.2%, for green gram 24.1% and for sesame 12%. More details are provided under component 3 of the report.

Increased business performance of EGS producing seed farms

- Three domestic seed companies (Green Growth Generation, based in Mandalay; Greenish Sagaing, based in Sagaing region; and Shwe Nan Taw, based in Mandalay) have successfully implemented a system of forward contracting agreement with DAR for the access to an agreed volume of EGS (breeder and foundation seed). In total six crops are included under these forward contracting agreements, including sunflower, chickpea, green gram, groundnut, sesame, and rice. The long-term contract on access to EGS is for five years. This business model will be helpful in solving one of the key bottlenecks in the lack of sufficient volume of EGS in the Dry Zone.
- A variety use agreement model, with regional exclusivity, has been approved by DAR to improve the sustainable supply of EGS. However it also needs to be approved by the national seed committee (NSC) because it includes royalty fees. Once approved, DAR can organize a partnership with a private seed company to provide a variety use agreement for a specific geographical region and specific variety. In parallel, the selected variety will be available in other regions for other seed companies. In return seed companies will provide a fixed rate of royalty fee to DAR.
- The project further established a digital EGS demand forecasting and supply system that includes 14 major food security crops and 227 varieties. The digital forecasting system has three key functions: a) a mobile-based application system for seed demand, where EGS users can place their seed demand and at the same time farmers can purchase the certified seed; b) a mobile-based application system for seed producers, for seed production planning and placing seed production figures in the system; and c) seed producer registration software to register existing and new seed producers with the DOA. All three systems are interlinked to digitize seed production, demand requests and seed transactions on a real-time basis. The mobile based application system 'Quality seed' is freely downloadable from the Google Play Store.
- The project support pilots with two DOA seed farms to use part of the revenue for investing in seed farm equipment and training of seed farms staff. As such, ISSD Myanmar has supported two seed farms (Kyae Mone in Monywa and Chaungmaygyi in Pyawbwe) to invest in supplementary irrigation and support seed farm management, invest in experience sharing with other seed farms in India, and invest in better tracking of results of seed production. Depending on the farm, year, and crop, yields on their pilot plots were between 35% and 55% higher than the other plots. Main conclusions from the pilots included that the seed farms in the Dry Zone desperately need supplementary irrigation both for the rainy (monsoon) season and the winter season. In combination with investments in soil fertility, yields can double or triple at these locations. The seed farm managers felt empowered by the two pilots as they had a greater say in the crop choice and were trained in better seed farm management (both technical and managerial).
- In total nine trainings were organized for staff of the DOA, DAR, and seed companies. In total 83 staff received intensive training on technical seed production, quality assurance and seed business management. These trainings were as follows:
 - Quality EGS production and field inspections, for the public seed sector (20-23 February 2018, Yezin, NPT)
 - EGS business model learning visit to India (20-23 November 2018, Gujarat, India)
 - Quality EGS production and seed quality control, for the private seed sector (20-22 December 2018, Zaloke, Sagaing)
 - Workshop on EGS business development (12-14 September 2019, Yezin, NPT)
 - Quality EGS production and seed quality control, for the private seed sector (22-23 August 2019, Monywa, Sagaing)
 - Quality EGS production, for seed producer groups and private seed companies in Mandalay region (9 February 2020, Kyaukse, Mandalay)
 - Quality EGS production, for seed producer groups and private seed companies in Sagaing region (11 February 2020, Monya, Sagaing)
 - Seed business model training for seed farm managers (17-19 August 2020, Yezin, NPT)
 - Training of trainers (TOT) on data entry and data management in digital seed demand forecasting (10 September 2020, online).

Increased local availability and uptake of quality seed at affordable price to smallholder farmers

- For the period 2017-2021 we achieved 6,536 metric tons of quality seed production for these combined years. The project end target was to produce 3,375 metric tons by 2020. The substantially higher result was a consequence of increased capacity and scaling partnerships with local seed businesses and private seed companies. Hence we achieved 94% more than our initial seed production target. The combined amount of seed was utilized by 80,644 farmers in the Dry Zone on 69,792 hectares, leading to higher yields of these farmers (see results of quality seed trials). Calculations of the number of farmers reached was based on the seed sale volume for each crop, the seeding rate used by farmers, and the average crop area of a family farm.
- A total of eight crops and 36 improved varieties were under seed production during 2017-2020. In total, 72 seed producers supported by WHH, four domestic seed companies and 311 seed producers under the scaling partnership were involved in seed production in the Sagaing, Mandalay, Bago, and Nay Pyi Taw regions during 2017-2021. A total of 62 field demonstrations were conducted by seed producers and domestic seed companies to create awareness and increase uptake of quality seed by farmers. A total of 330 new improved variety demonstration plots (11 varieties of rice, 8 varieties of sesame, 7 varieties of chickpea, 2 varieties of groundnut, 1 variety of green gram, and 1 variety of pigeon pea) were demonstrated in the field. A total of 9,300 farmers visited the field demos.
- We organised a survey in November 2020, for four private seed companies that had been supported by the programme since 2018, to measure performance and satisfaction in four areas: being technically well equipped, market-oriented, professionally well organized, and strategically linked. The survey found that the programme contributed to major improvements in being technically well-equipped (38% increase compared to the baseline), followed by market orientation (33% improvement), strategic linkage (16% improvement) and being professionally organised (12% improvement). The average of the four areas was a 25% improvement in performance compared to the baseline. Similarly, we conducted a survey under 68 seed producers who had been directly supported by the programme since 2017. The survey found a 40% to 75% improvement in four key performance areas of the programme intervention within a three-year period.
- Based on the trainings and experience-sharing missions, we have finalized quality seed production manuals for chickpea, green gram, sunflower, sesame, and groundnut crops in 2021. The seed production manuals provide detailed guidelines for breeder, foundation, registered and certified seed production, information on varieties that are most demanded by farmers, and information on the common diseases and pests of these crops. These manuals will be immensely useful to both the breeders and seed producers in Myanmar.
- The Department of Cooperatives (DOC), with the support of the ISSD Myanmar programme, established a new seed producers' cooperative unit (SPC unit) in Nay Pyi Taw in 2019 to coordinate and provide long-term support to all SPCs in Myanmar. ISSD's programme staff were embedded at the SPC unit of the DOC in 2020 and provided training and orientation to the SPC DOC staff.
- Together with the DOC we also finalized SPC management guidelines. The guidelines describe how seed producer cooperatives can be established and provide tools for improving performance. The guidelines include a standardized by-law for SPC management in Myanmar. In 2020, the DOC also received a World Bank loan to further strengthen the SPCs.
- We organized two partnerships with Dutch seed companies, one with East West Seeds and one with Solynta and Bejo. For the latter we implemented pre-commercial trials for two hybrid potato seed varieties in Shan state, assessing local production suitability and market/consumer preferences. Results were promising but needed replication, which was planned for 2021. This partnership was organized with the additional support of the Dutch Topsector Horticulture and Planting Material. A second partnership, with East West Seeds, focused on seed production of two hybrid bitter melon and yard long bean varieties. In this project, five farmers were trained on seed production, and we jointly organized a field day in Nay Pyi Taw for 70 neighbouring farmers. In addition, the two varieties were registered at DAR for plant breeder's rights. The pilot will further increase the position of Myanmar as a major vegetable seed production country. At the time we were also in communication with other Dutch seed companies that were interested in investing in seed production activities in Myanmar.
- Mobility restrictions and social distancing measures impacted on conducting larger group-based trainings and workshops for seed producers in 2020. Instead of this, the programme team developed smaller

group-size and shorter-format training and coaching sessions. A total of 165 seed producers benefited from these training sessions, which focused on quality seed production and seed business development. Larger workshops were organised using online platforms such as Zoom.

Lessons learned

We learned that the integrated nature of the project is well appreciated by the Myanmar government and private sector. Working on both systemic bottlenecks in the enabling environment (such as quality EGS provision and improving the seed business climate) and training activities on the ground (supporting seed farms, seed producers and seed companies), was of considerable help in developing a more vibrant public-private seed sector. Strong relations between government experts, seed farms and seed producers also helped significantly in improving quality seed production (the volume of seed), seed quality (genetic and physical purity / certification) and the varieties portfolio (ensuring a greater choice for farmers and the introduction of new varieties).

In terms of increasing seed production by seed producer cooperatives and seed companies, the project has been very successful. The project exceeded its own targets in terms of tons of seed produced and number of farmers supported. The main reason for its success was the strong collaboration with the district and township offices of agriculture and their departments of cooperatives. In addition, the approaches and tools (based on the local seed business model developed in Ethiopia and Uganda) fitted the Myanmar reality well, providing emphasis not only on production activities, but also on aspects of internal management, sales and marketing, and strategic partnerships. Through embedding the seed producer cooperative guidelines within the department of cooperatives at union level, we hope and expect that this success can be replicated by the government itself.

Despite the outbreak of Covid-19 in 2020 we were still able to implement many activities. Our team on the ground, both in Nay Pyi Taw and Sagaing, was able to continue training activities for DOA and DAR staff as well as seed producers and seed companies. The military coup that started in February 2021 however had far-reaching consequences on the further embedding and development of the programme's seed sector activities. We were unable to further scale out DOA seed farm pilots, or to implement variety use agreement models with DAR. As a result, most activities in 2021 focused on documentation of lessons learned, in particular the institutional innovations related to the seed producer cooperative model and guidelines, the quality seed production manuals, scaling the digital seed demand forecasting system, and strengthening the MSA. For each of these topics dedicated reports/guidelines were developed that are accessible on the ISSD Myanmar website, or on request from abishkar.subedi@wur.nl

3 Introduction

The ISSD Myanmar programme (2017-2021) envisioned a vibrant and pluralistic seed sector that caters for the quality seed needs of smallholder farmers in Myanmar's Dry Zone. The programme consisted of three different components, which are also the three outcome areas of the programme. The first component is seed sector coordination, with the outcome of improving seed sector coordination. The second component is EGS production, with the outcome of increased business performance of EGS-producing seed farms. The third component is seed business development, with the outcome of increased local availability and uptake of quality seed at affordable prices to smallholder farmers.

The first two components were coordinated by Ministry of Agriculture, Livestock and Irrigation (MOALI) through a dedicated ISSD programme office located within the DOA's Seed Division in Nay Pyi Taw. The third component was coordinated by Welthungerhilfe (WHH) through two field offices located in Myinmu and Pathengyi townships in the Dry Zone. The programme's overall coordination lay with Wageningen Centre for Development Innovation (WCIDI), Wageningen University and Research (WUR). WCIDI was responsible for project financial control, monitoring and evaluation, reporting and accountability, and technical assistance. Resilience, an agribusiness consultancy company, provided technical assistance for the implementation of the first and second programme component.

The ISSD Myanmar programme operated in four regions of the Dry Zone of Myanmar: Sagaing, Mandalay, Nay Pyi Taw and East Bago. The eight selected crops are: rice, green gram, black gram, pigeon pea, chickpea, sesame, groundnut and sunflower. The programme aimed to reach 75,500 smallholder farmers with locally available quality seed of well adapted varieties of rice, food legume and oilseed crops in the Dry Zone of Myanmar.

4 Results and Outcomes

We have organised this chapter according to the three programme components and the outputs and outcomes associated with the components.

4.1 Seed sector coordination

Improved seed sector coordination is the first outcome of ISSD Myanmar. MOALI coordinated this component with support from Resilience and WUR. In table 1 we provide the key outcomes and outputs against the target indicators for component 1 in 2021. A summary of the main achievements of the programme for the period 2017-2021 are explained below.

Table 1. Key outcomes and outputs against the target indicators for component 1 in 2021

Indicator	EOP target	2018 result	2019 result	2020-2021 result	Total	% EOP reached
OUTCOME 1: Improved seed sector coordination						
# of collaborations established or strengthened	15	7	4	3	14	93%
# of studies implemented in the Dry Zone	6	6	0	0	6	100%
# of actors participating in seed platform meetings	40	75	75	40	75	188%
Types of actors participating in seed platform meetings	7	9	10	11	11	157%
# of joint pilots on seed value chain issues endorsed	4	3	1	0	4	100%
# of regional seed growers associations established	4	0	0	0	0	0%
National seed association established	1	0	1	1	1	100%
# of seed association meetings	4	0	2	2	4	100%
# of seed association members	12	0	12	12	12	100%
# of studies implemented in the Dry Zone	2	1	1	2	4	200%

4.1.1 Implementation of seed demand assessment study for the Dry Zone

The study on seed demand assessment was done in 2018 in partnership with the Centre for Economic and Social Development (CESD), Department of Agricultural Research (DAR), Michigan State University (MSU) and International Food Policy Research Institute (IFPRI). The study was undertaken in six townships of the Dry Zone, interviewing 1,383 farm households growing rice, pulses and oilseed crops. The publication of the study can be found in the weblink:

<<https://www.canr.msu.edu/resources/variety-adoption-and-demand-for-quality-seed-in-the-central-dry-zone-of-myanmar>>

The main findings of the study were shared with seed sector stakeholders during the fourth National Seed Platform meeting in Nay Pyi Taw. Below are a number of key conclusions of the study:

- Use of improved varieties in the dry zone as a percentage of total household varieties is: 41% for sunflower, 37% for chickpea, 33% for green gram, 31% for rice, 29% for black gram, 19% for sesame, 15% for groundnut and 8% for pigeon pea.
- In terms of area planted with improved varieties as a percentage of total cropped area, the adoption rates based on farmers' self-assessment are: 54% for sunflower, 42% for chickpea, 41% for green gram, 38% for rice and black gram, 21% for sesame, 17% for groundnut and 11% for pigeon pea.
- Key reasons for growing improved varieties are: higher yield (61%), market value (55%), suitable for local soil (27%), and promoted by neighbours (19%).
- Close to 90% of farmers indicate that the source of exposure to new varieties is through 'observation of the variety in other farmers' fields', 5% indicated 'heard from traders', and 2-3% indicated 'observed in demonstration field'.
- Farmers source seed from formal (government seed farms, seed companies, agro dealers shops), intermediary (farmer seed producers) and informal seed systems (own saving, neighbours and local grain market). Rice seed is sourced almost 100% from formal and intermediary seed systems (farmers seed producers, government farms, seed companies, agro-dealers), while other crops seed

sourcing from formal seed system is 81% in black gram, 75% in sunflower and chickpea, 68% in green gram, 64% sesame, 59% groundnut and 38% pigeon pea.

- Relatively low rates of seed replacement are observed in the dry zone, ranging from 6.6 years for sunflower and 6.9 years for rice to 13.2 years for pigeon pea.
- Farmers are willing to pay a price premium above the reported seed market price for specific varietal traits in: rice and sesame (17%), pigeon pea (16%), chickpea (13%) and groundnut (5%).

4.1.2 Establishment and facilitation of national seed sector platforms

In total seven National Seed Sector Platform Meetings took place. Below you find the highlights for each of them:

1. ISSD Myanmar organized the first national seed sector platform meeting on 4 April 2017. Also during this meeting the ISSD programme was officially launched. The Honourable Minister Dr Aung Thu of MOALI gave an opening speech; and the Director General of DOA, Dr Ye Tint Tun and the Netherlands Ambassador to Myanmar, Mr Wouter Jurgens signed a Plan of Operations (POP) – officially approving the implementation of the programme. Around seventy participants from government, private sector and development partners attended the event. During the meeting the Seed Sector Action Agenda was discussed. Based on the outcomes of the platform the Action Agenda was finalized and approved by the DG of Agriculture. After the Platform meeting the project staff, together with the Seed Division Director developed a full list of all 60 permanent platform members, 20 from each from the public sector, private sector and development partners. In addition, a Terms of Reference was developed for the Platform Secretariat. The Platform Secretariat consists of 9 members, 3 each from public (DOA and DAR) and private sector (MSA members and a seed producers), and 3 from development partners (ACIAR, IFC and ISSD). The Secretariat (all Myanmar nationals) prepares the agenda for the National Seed Sector Platform meeting and follows up on the action agenda.
2. ISSD Myanmar organized the second national seed sector platform meeting on 29 September 2017. The meeting focused on the regulatory reform agenda and was organized in collaboration with the IFC-WBG Input Reforms project. At the meeting the Platform Secretariat was launched and presentations were provided on plant breeders rights (DAR), the pest risk assessment (PPD) and the Myanmar Seed Association. The main topic of the second National Seed Sector Platform meeting was the seed regulatory framework. We presented the outcomes of three earlier round table meetings that were held in Yangon, Nyaung Shwe (for Shan State) and Mandalay (for the Dry Zone). In four smaller groups we discussed and prioritized the most important topics for regulatory reform. This resulted in 6 major and 6 smaller proposals for regulatory change.
3. The third National Seed Sector Platform was organized on 17 May 2018. The topic of the platform meeting was 'public-private collaboration', and there were two main topics: public-private collaboration and the role of research (presented by the Deputy DG of DAR) and best practices in risk-based management (by Dr. Augustine Langyintuo of IFC-WBG). In addition, the recent regulatory changes were presented by Daw San Kyi (Deputy Director of the Seed Division). The regulatory changes resulted from the decisions of the National Seed Committee and they present a major improvement for companies to start and operate a seed company in Myanmar. Also, Dr Papa Win of DAR presented on the establishment of the PVP Office; including an appeal to companies to start up the PVP-registration of their varieties. In the break-out sessions the regulatory changes were discussed and further explained. In addition, participants were asked to propose further improvements (which could be considered by the NSC) for the future. In the other two parallel sessions the amended PVP law was discussed as well as concrete ideas for implementing risk-based management in Myanmar's seed sector.
4. The fourth National Seed Sector Platform meeting was organized in collaboration with the World Seed Partnership, consisting of ISF, ISTA, OECD, UPOV and WFO. The meeting discussed the international standards for seed production and how Myanmar can comply with these. In particular we followed up on the ISTA accreditation of the Nay Pyi Taw Seed Lab. As a result the Seed Lab has now applied for a proficiency test (for rice) in 2019 (which will inform the capacity of the lab to get internationally accredited). A second topic of the NSP was a presentation and discussion on Seed Business Opportunities in Myanmar. The presentation (and resulting report) highlights opportunities for domestic and international companies to invest in Myanmar's seed sector, especially for the crops: hybrid corn, sunflower, vegetables and potato.
5. The fifth national seed sector platform meeting was organized in Nay Pyi Taw on 14 May 2019. The topic was 'Alternative seed quality assurance systems' and was attended by 99 participants (44 from the public

sector, 17 from the private sector and 28 from development partners). The platform discussed three quality assurance systems: truthfully labelled seed, quality declared seed and the participatory guarantee system. There was a guest speaker from Uganda (Mr. Bonny Ogwal, ISSD Uganda) and the keynote was provided by Dr. Manish Patel, Executive Director of Incotec India, explaining about advancements in seed quality assurance and the role of the private sector. The platform concluded that, given Myanmar's seed regulatory framework and seed quality standards, the participatory guarantee system is most suitable for the intermediate seed systems of Myanmar.

6. The sixth seed sector platform meeting had the topic: 'Developing a national seed investment plan for Myanmar'. The meeting was held on 6 November 2019 and brought together 90 participants, 39 from the public sector, 23 from the private sector and 28 from development partners. ISSD Myanmar collaborated with the Syngenta Foundation on this platform meeting, both in the preparations and implementation. During the meeting the idea of a seed investment plan was discussed with four distinct topics: the Myanmar Seed Valley concept; private sector investments; regulatory services and a one-stop-shop; and local seed production. The Myanmar Seed Valley concept received particular attention and interest and it was decided to develop a plan and proposal for this. It should bring together a number of domestic and international seed companies producing and processing seeds, as well as providing seed related services (e.g. quality assurance, variety testing). To this end a detailed agronomic assessment was undertaken that included soil and water analyses of the envisaged location (Hlaingtet Central Farm), as well as a water needs analysis.
7. Because of the Covid-19 mobility restrictions, the seventh national seed sector platform meeting was organized online on 3 June 2020. The topic was 'A national Covid-19 response for the seed sector' and was attended by 40 participants (13 from the public sector, 10 from the private sector, 9 from development partners and 8 from non-governmental organization). At the meeting, DG of Department of Agriculture delivered the opening speech and DG of Department of Planning shared response of MOALI to Covid-19. ISSD Myanmar Programme leader Dr. Abishkar Subedi presented the rapid assessment report of impact of Covid-19 on Myanmar's seed sector. Mr. Brett Ballard from Livelihood and Food Security Fund (LIFT) and Mr. Ashok Murarka presented their organisation's response to the crisis: respectively the cash for work programme and Tropical Biotechnology company's response to Covid-19.

The meeting organized four break-out sessions: (1) mobility and logistics for all seed related activities; (2) emergency response for hardest hit households; (3) demand side challenges: creating incentives for farmers to buy seeds; and (4) supply side challenges: supporting seed companies and producers. The rapporteurs of four groups presented the biggest issues, solutions and key stakeholders involved in each action in the plenary session. The meeting was successfully finished and all the presentations can be found through the following links: <<https://issdmyanmar.org/2020/06/04/7th-national-seed-sector-platform-meeting-in-the-air/>>

Importantly, during the platform meetings many new collaborations were established and a better coordination took place between other seed sector projects (the Japan International Cooperation Agency (JICA), the Agricultural Development Support Project (ADSP), Syngenta Foundation, the Livelihoods and Food Security Fund/Myanma Awba Group (LIFT-AWBA), the International Finance Corporation-World Bank Group (IFC-WBG) and the Rice seed sector development (RSSD) project.

In the end, we didn't organize the 8th National Seed Sector Platform meeting. Main reason for this was the approved budget neutral extension till June 2021, and the plan to organize one last big 'physical' event in Q2 of 2021, in which all achievements and activities of ISSD Myanmar would be presented and discussed. Due to the coup in February 2021 it was not possible to organize this event.

4.1.3 Establishment and support of the National Seed Association

ISSD Myanmar assisted in the development of the Statutes of the Myanmar Seed Association in 2017. During the second half of 2017 the Myanmar Seed Association (under establishment) finalized its application for DICA, the Directorate of Investment and Company Administration. DICA in turn requested MOALI for advice on the association's application (including their statutes). MOALI recommended to broaden the composition of the Association, beyond seed importing companies and multinational companies; effectively rejecting the application.

During 2018 and the first half of 2019 we assisted the leadership of the Association to make the necessary changes to the Statutes. These changes included the introduction of a number of domestic seed production companies and larger seed producers to the group of founding fathers. After the changes were incorporated in

the application, was approved by DICA, with MSA's official registration taking place on 9 August 2019. The Association was officially launched at the sixth national seed sector platform meeting and discussions were held afterwards on the Association's strategic plan. A draft strategic plan was developed towards the end of 2019, and during Q1 2020 this strategic plan was finalized.

In 2020 ISSD Myanmar further supported the Association in the recruitment of an Executive Secretary. Together with the Board of MSA a vacancy was developed and candidates were interviewed. The Executive Secretary started on January 2021. In addition, ISSD Myanmar supported the Association in the development of a Strategic Plan for the next four years. The Strategic Plan includes activities to expand services to members and have a more regular and structured dialogue with government office like the Seed Division and Plant Protection Division.

At the moment MSA has monthly Executive Committee meetings and is building a partnership with the Asia Pacific Seed Association (APSA).

4.1.4 Implementation and presentation of studies on key seed sector bottlenecks

Study on Business Opportunities in Myanmar's Seed Sector

We completed a study on Seed Business Opportunities in Myanmar at the end of 2018. The report highlighted opportunities for domestic and international seed companies to invest in Myanmar's seed sector, especially for the crops: hybrid corn, sunflower, vegetables and potato. The report provides information on four aspects: viz. a) laws, regulations and procedures; b) seed production and breeding; c) seed sales and, d) opportunities for seed related materials and services. Findings of the study were presented at the fourth national seed platform meeting.

- *Seed business size:* The whole seed market in Myanmar is estimated at US\$ 0.5 billion, including opportunity cost of on farm saved seeds, half of which is rice. Seeds for many crops are currently supplied by the public sector. The public sector supplies less than 5% of the total farm level seed demand. For maize, cotton and several vegetable crops seed is supplied by the private sector. Already in 2016 there were over 30 seed companies active in Myanmar of which now at least 10 are producing or are preparing to produce some seeds domestically.
- *Laws, regulations & procedures:* In recent years much of the seed related laws, regulations and procedures have been changed. The latest version of the Myanmar Seed Law is from 2015 and the new regulations were approved in 2016. In addition, a new Law on Plant Variety protection was approved in 2016. All seed-related Laws, regulations and procedures are brought together under the Myanmar Seed Portal, www.myanmarseedportal.gov.mm This includes information on establishing a seed business, the registration of varieties and seed trade (import/export). Applications can be submitted online.
- *Business opportunities for seed production:* Myanmar has good locations for seed production have the right climate for that specific crop, the right soil type and enough quality water. Seed production is an activity that requires (for many crops) a lot of workers and thus is done in cheaper labour countries. As such, Myanmar offers a wide variety in soils and climates. The availability of land and water is good. Daily wages are still fairly low (US\$ 3-4 US\$ /day versus > US\$ 10 in Thailand). Now with the recent changes in the regulatory framework by the government, Myanmar becomes a very interesting seed production country.
- *Seed production & breeding:* The seed production of corn is possible in many locations but if possible a little cooler weather can help seed quality. In Myanmar corn seed production is done large-scale for use as fodder. Of the corn seed production areas in Thailand some are very advanced. Farmers produce seeds almost year round in the low land with drip irrigation and good disease and pest control. A similar set-up is possible in several locations in Myanmar. Once certain areas have skilled farmers, more companies will come and try to contract them. If one company would set up a high quality shelling facility it is able to offer drying and shelling services to others.
- *Business opportunities for seed sales:* It is clear that there are ample opportunities in the market in Myanmar for selling good quality seeds in vegetables, hybrid corn, potatoes and sunflower. But there are clear differences. If entering the market for vegetables or hybrid corn you will compete in a reasonable good supplied market with experienced companies, multinationals and local, who have good adapted varieties for sale and know the market. In potatoes and sunflower there is still a clear shortage of good planting material, so entering the market with just good seeds of the current known varieties could be a first step.

Quality seed trials

We carried out studies on quality seed trials to generate field evidence on the additional yield farmers gain in the Dry Zone by using the quality seed of improved varieties. We choose three crops for analysis as indicator crops for the Dry Zone. The crops included rice (cereal), green gram (pulses) and sesame (oilseed crop). From our

previous study, we found that farmers source the seed of these crops from four major seed channels or seed systems, i.e. informal seed system (farm saved seed), intermediary seed system (seed produced by seed producers or cooperatives), public seed system (seed produced by public seed farms) and private seed system (seed produced by private seed companies). We decided to include all four sources of seed per crop in the analysis. In our trial, we used farm saved seed (or informal seed) as control to see whether farmers would gain by purchasing the certified or quality seed from the market. We established 5 replicates per crop in the Department of Research (DAR) station in Yezin. While we also established 47 field trails per crop in the farmers field in Mandalay and Sagaing, observing yield differences between the research station and farmers condition. The study found that seed produced by seed farms performed well in the farmer trials, yields of these seeds were respectively 25.8%, 32.8% and 21.7% higher for rice, green gram and sesame than farm saved seed. In addition, seed produced by seed companies also had higher yields than farmer saved seed. For the trials undertaken at farmer fields the difference for rice was 26.2%, for green gram 24.1% and for sesame 12%.

Rapid assessment of Covid-19 impact to the Myanmar seed sector: seed alerts (April-May)

The global pandemic of Covid-19 resulted in mobility restrictions in Myanmar. This has impacted the operations of the seed sector. However, there was less clarity on the specific parts of the seed sector that were impacted by Covid-19. Therefore, the ISSD Myanmar programme team and the Department of Agriculture (DOA) of MOALI took the lead in conducting a rapid assessment. The rapid assessment looked at the impact of Covid-19 measures on the Myanmar seed sector. As such, in April 2020, we undertook a survey with 36 informants from 23 different organisations, representing the private sector, public sector and NGOs. The survey results were shared in three focus group discussions with panels of in total 20 experts. Discussions focused on the crops: rice, pulses and oilseeds. We developed a dashboard to visualize the level of impact ('severe negative impact', to 'no impact') on different aspects of seed sector performance. Together with the panels of experts we prioritized four alerts; key bottlenecks and challenges to the seed sector and how to respond to these specific challenges. The four alerts were:

- Alert 1: Measures reduced the mobility of farmers and seed entrepreneurs, and thereby reduced farmers' access to quality seed
- Alert 2: Measures affected regulatory functions in seed import, variety release, and registration
- Alert 3: Measures affected the affordability of quality seed for farmers
- Alert 4: Measures hampered the production and supply of early generation seed (EGS)

The seed alert was shared during the seventh national seed sector platform meeting on 3 June 2020. Also separate discussions were held with MOALI to discuss the outcomes of the alerts (and possible mitigation measures). This processes were found to be helpful in the development of a Covid-19 economic recovery plan for the seed sector by the Myanmar government. The seed alert document was published in May 2020 and can be accessed through this link <<https://issdmyanmar.files.wordpress.com/2020/06/Covid-19-seed-alert01-myanmar.pdf>>

Rapid assessment of Covid-19 impact to the Myanmar seed sector: seed alerts (June-July)

The level of mobility restrictions changed in the period May-June and this resulted in a different type of impact on the seed sector. We repeated the rapid assessment in June with the same respondents and focus group participants. However, we have focussed on vegetables and field crops this time. Four alerts identified in June-July assessment are:

- Alert 1: Measures reduced the activity of variety development and release
- Alert 2: Measures affected the seed production operations
- Alert 3: Measures affected seed marketing
- Alert 4: Measures affected the reduced food, nutrition and income security of the country

Peer review article publication of Covid-19 impact on the seed sector

The ISSD Myanmar programme team of WUR and MOALI (Myanmar), together with the project teams of Nigeria, Ethiopia and Uganda jointly published the journal article: 'Rapid assessment of the impact of Covid-19 on the availability of quality seed to farmers: Advocating immediate practical, remedial and preventive action'. The article was published in the journal *Agricultural Systems*. The article is open access and can be found through the link <<https://www.sciencedirect.com/science/article/pii/S0308521X20308982>>

4.2 EGS production

The second outcome of the ISSD Myanmar programme is the increased business performance of EGS-producing seed farms. Within the public system, DAR and DOA seed farms are responsible for EGS (breeder seed, foundation

seed and registered seed production); below you can find a summary of achievements for the 2017-2021 period. Table 2 shows the key outcomes and outputs against the target indicators for component 2 in 2021.

Table 2. Key outcomes and outputs against the target indicators for component 2 in 2021

Indicator	EOP target	2018 result	2019 result	2020-2021 result	Total	% EOP reached	
OUTCOME 2: Increased business performance of EGS producing seed farms							
# of seed farms working with new business model for EGS production	10	0	5	10	10	100%	
# of persons (male/female/youth) reached/trained with improved technology and skills in EGS production							
	Female	15	24	34	12	34	227%
	Male	15	31	20	49	49	327%
	# <35	5	20	24	8	24	480%
	total	30	55	64	61	83	276%
# of crop types covered by the EGS study	3	3	0	0	3	100%	
# of EGS business pilots implemented in DAR and DOA farms	4	0	2	1	3	75%	
# of trainings/workshops for EGS seed farm staff	8	4	3	4	11	138%	
# of DAR and DOA staff trained							
	Female	15	24	34	12	34	227%
	Male	15	31	20	49	49	327%
	# <35	5	20	24	8	24	480%
	total	30	55	64	61	83	276%
Direct	Female	15	24	34	12	34	227%
	Male	15	31	20	49	49	327%
	# <35	5	20	24	8	24	480%
	total	30	55	64	61	83	276%

4.2.1 Piloting of alternative models for EGS seed production

Implementation of early generation seed business model study

In 2018, we completed the EGS study in eight public seed farms operating in the Dry Zone. Key aim of the study was to develop a sound basis for alternative business models to organise and finance the EGS production in public seed farms which provides long-term sustainability, and accelerate public-private partnership. The study included four DOA seed farms viz.: Chaung May Gyi, Kyae Mon, Yae Oo, Sint Kaing, and four DAR research farms viz.: Tat Kone, Se Bin, Kyauk Se and Zaloke. We did a cost-benefit analysis of public seed farms operations, estimating the demand, and productivity of seed farms by analysing 2014 to 2017 (4 years) data. Key findings of the study were:

- DOA seed farms utilised on average 42% of available land for seed production, while DAR research farms utilise on average 31% of their land for seed production between 2014 and 2017.
- DOA farms achieved a year on year increase in seed production. A total of 11,724 baskets of seed were produced in 2014 whereas a total of 15,627 baskets of seeds were produced in 2017.
- DAR research farms also achieved an increase in seed production from 2014 to 2016, however, in 2017 seed production decreased. The DAR farms produced a total of 6,929 baskets of seed in 2014 and in 9,322 baskets in 2016, with a sharp decrease to 3,409 baskets in 2017.
- DOA invested a total of US\$ 241,418 in four seed farms from 2014 to 2017 and the total revenue generated from seed sales in the same period was US\$ 131,163. DOA farms observed on average a 41% loss on investment on an annual basis.
- DAR invested a total of US\$ 277,431 in four research farms from 2014 to 2017 and the total revenue generated from seed sales was US\$ 264,094. This means that DAR farms experience a 5% loss on investment.
- Both DOA and DAR farms are selling their seed at a 30% lower price than their actual production cost.
- There are clear differences between profits and losses between crops; seed production of hybrid corn, hybrid sunflower, rice, sesame, green gram and chickpea are found to be profitable at many farms, whereas seed production of pigeon pea and sesame run at a loss.
- There is a negative correlation between farm size and profitability of seed production. The larger the size of the seed farm the lower the profitability of its seed production activities.

Based on these results pilots were started with two DOA seed farms to increase autonomy, revenue generation, and productivity. Below you find the results of these two pilots:

- The main objective of the seed farm pilot was to allow two seed farms to use part of the revenue for investing in seed farm equipment and training of seed farms staff.
- Before the pilot the seed farms needed to channel all seed farm revenues back to the Ministry of Agriculture with limited incentive to increase production and productivity. In general, seed farms are underfunded and as such lack mechanisation equipment and (supplementary) irrigation.
- Therefore ISSD Myanmar supported two seed farms, Kyae Mone in Monywa and Chaungmaygyi in Pyawbwe, to invest in supplementary irrigation and support the seed farm management in experience sharing with other seed farms in India, and better tracking of results of seed production.
- As part of the pilot specific parts of the seed farm that received additional investments were compared with parts that produced like before. The model worked in such a way that the revenue from the pilot would be fully reserved and re-invested in the seed farm in the next cropping season (as a revolving fund).
- Depending on the farm, year and crop, yields on the pilot plots were between 35% and 55% higher. Still absolute yields are low; with average yields for chickpea reaching 1.3 tons/ha (roughly 15 baskets per acre) and for sunflower 0.9 t/ha (roughly 10 baskets per acre) (FAOstat). This is mainly due to the very low soil fertility situation at the two selected seed farms, with very low soil organic matter and high pH (of 8.5).
- Both sites were affected by even drier than normal conditions in the 2019 and 2020 production years. While average rainfall in Sagaing is 790 mm per year, actual precipitation in Sagaing was respectively 460 mm and 510 mm in 2019 and 2020. This further shows the need for supplementary irrigation and cost recovery and investments in the seed farms in this area.
- Main conclusions included that the seed farms in the Dry Zone desperately need (supplementary) irrigation both for the rainy (monsoon) season and the winter season. In combination with investments in soil fertility yields can double or triple in these locations. The seed farm managers felt empowered by the two pilots as they had a greater say in the crop choice and were trained on better seed farm management (both technical and managerial). Overall, all DOA seed farms have seen very limited investments in the past decade; on the contrary, the best farms were sold off in the early 2010s, and the remaining ones have more problematic soils and rainfall conditions.
- A more semi-autonomous system, whereby seed farms can generate own revenue that they can reinvest in subsequent seasons looks promising. Through in the current pilot set-up we were not able to pursue this model fully (as separate bank accounts were not allowed at the time). Still, if things normalize again in Myanmar this model is worth trying, with some upfront investments (e.g. in the form of a loan) needed to kickstart higher production and revenues.

Long-term forward contracting of EGS

Three domestic seed companies (Green Growth Generation seed company based in Mandalay, Greenish Sagaing seed company based in Sagaing region, and Shwe Nan Taw seed company based in Mandalay) successfully implemented a system of forward contracting on guaranteeing the access to agreed volume of the early generation seed from the DAR. One additional crop 'groundnut' was added in 2020 so the total crop under the long-term contract reached six, including sunflower, chickpea, green gram, sesame and rice. The long-term contract on access to EGS is for five years. An extension is possible beyond the end of the contract, in which both parties can continue research and cooperation accordingly. DAR has provided the technical support to the seed companies on quality EGS production technologies on a cost-recovery basis. This business model will be helpful in solving one of the key bottlenecks in the lack of sufficient volume of EGS in the Dry Zone.

Implementation of a variety use agreement with private seed companies using a regional geographical exclusivity model

The variety use agreement model with regional exclusivity was by DAR to improve the sustainable supply of EGS. However, there is a need for the National Seed Committee's (NSC) approval because it includes royalty fees terms and conditions. According to a government lawyer, the proposed agreement must submit to Attorney General Office as well as other relative departments before signing it. It is noted that National Seed Committee has the authority to grant the approval of signing the mutual benefited agreement and the necessary submission procedures are still under process. DAR is trying to have a variety use agreement with one of the AWBA Group Branches company for hybrid corn production and distribution and it is still ongoing. The demand for hybrid sunflower, hybrid corn will take into account once the mutual agreement works. In this model DAR organizes a partnership with a private seed company to provide a variety use agreement for a specific geographical region. At the same time, the selected variety will be available in other regions for other seed companies. In return seed companies provide a fixed-rate of royalty fee to DAR.

Digitized EGS seed demand forecasting system

We scaled up the digital EGS demand forecasting and supply system to 14 crops and 227 varieties (table 3). The scaling partnership was carried out with the RSSD project in the Delta region of Myanmar funded by LIFT with ISSD Myanmar programme. RSSD project implemented a pilot for rice first. The forecasting system has three key functions: a) a mobile based application system for seed demand where EGS users can place their seed demand and at the same time farmers can purchase the certified seed b) mobile based application system for seed producers who can make seed production planning and place their seed production figure in the system and c) seed producer registration software to register existing and new seed producers by DOA. All three systems are interlinked to digitize: seed production, demand requests and seed transactions on a real time basis. The mobile based application system 'Quality seed' is freely downloadable from google play store. This quality seed app has also voice guided system for the farmers who can read the text. The digital system has brought public seed farms, seed companies, seed producers and farmers in one platform in order to real-time estimate demand and supply for different seed classes. The Seed Division of DOA (MOALI) is taking the coordination role of data management.

Table 3. Crops and number of varieties included in the digital application system and quality seed app

Crop name	# of varieties	Crop name	# of varieties
Rice	172	Green gram	2
Wheat	2	Black gram	2
Maize (hybrid)	3	Chickpea	9
Sorghum	1	Pigeon pea	5
Butter bean	1	Groundnut	10
Lab lab bean	1	Sesame	15
Suntani pea	1	Sunflower	3

4.2.2 Building capacity of seed farm staff on EGS production

Introductory training on seed business management

ISSD Myanmar supported capacity building activities for seed farm staff. In 2016 and 2017, DOA and DAR seed farm staff were able to benefit from two trainings through a tailor-made training programme funded by the Netherland Fellowship Programme, coordinated by WCDI: one training on quality EGS production 5-16 December 2016 in Yezin; and another introductory training on seed business management from 13-22 March in 2017.

Training on quality EGS production and field inspection training to public seed sector

A 4-day training course was organised on EGS production of hybrid sunflower and pigeon pea at DAR- Yezin between 20 and 23 February 2018. The training course resulted in improved capacity of seed farm staff on quality EGS production, specialised field inspections, pest and disease management, soil fertility management and post-harvest seed processing operations. A total of 25 participants (12 staff of DOA seed farms, 8 staff of DAR research farms, 3 staff from the seed quality testing labs and 2 staff from the Seed Division) participated in the training course.

A 4-day training course was organised on EGS production of black gram, green gram and sesame at DAR-Yezin during 28 and 31 March 2018. The training course resulted in the improved capacity of 24 seed farm staff from DOA and DAR in Mandalay, Sagaing, Nay Pyi Taw, and East Bago.

EGS business model learning visit to India

A 4-day learning visit on 'EGS business models' was organised between 20 and 23 November 2018 in Gujarat State, India. The visit was facilitated by Incotec India, a private limited company. The visit mainly focussed on pulses and oilseed crops. Nine senior staff from the programme joined in the learning visit viz.: 5 managers from DOA and DAR seed farms (Kyae Mone, Chaung May Gyi, Oak Phyat, Zaloke, Tat Kone); the Deputy Director of the Seed Division, and three ISSD programme staff. The participants visited three private seed companies, Junagadh Agriculture University, the National Seed Corporation, Incotec's seed quality enhancement facilities, and the Indian Council of Agriculture Research (for pulses and oilseed crops). Key reflections focused on the importance of strong public-private partnerships for crop breeding and EGS production; increased private sector involvement in providing seed quality assurance; having a contractual model between the National Seed

Corporation and private seed producers; the strong linkage between public universities and the private sector for EGS supply; and the presence of an EGS demand and supply system; as well as the existence of Truthfully Labelled Seed (TLS) system for seed quality assurance. The findings will be important inputs for the development of new business models in public seed farms in Myanmar.

Training on quality EGS production and seed quality control to private seed sector

A 3-day training course (20-22 December 2018) was organized on EGS production of hybrid sunflower and chickpea at Zaloke Research Farm (DAR), Sagaing region. A total of 27 participants representing 6 private seed companies, 17 participants from private seed producer groups and 6 staff from the Seed Division of Sagaing and Mandalay improved their knowledge and skill on quality EGS production, and seed quality control in the field.

Training workshop on EGS business development

A 3-day workshop was organized to share the results of the ISSD Myanmar programme on EGS business development, challenges, action plans, and process of application of the plant variety protection system in Myanmar. A total of 44 participants from public, private and NGOs seed project staff attended the workshop on 12-14 September 2019 in Yezin.

Training on quality EGS production and seed quality control to the private seed sector

Two refresher training programmes on quality EGS production and new variety characteristics were delivered to public seed farms sector experts and private seed producers on 22-23 August 2019 in Monywa township. The training courses were attended by 80 participants and covered green gram, black gram, pigeon pea and groundnut crops.

Training on quality EGS production to seed producer groups and private seed companies in Mandalay region

A one-day training course was organized on EGS production, characteristics of different varieties and quality control on Sunflower and Chickpea was organized on 9th February 2020 in Kyaukse, Mandalay Region. A total of 32 seed producers joined the training course. The training course was resulted in the improved knowledge in importance of pollination in seed production, isolation distance and its importance, best time of planting, crop cultivation, plant protection, soil management, weed control, rouging, harvesting, field inspection, post-harvest operation and seed inspection in each participant. Participants could learn the characteristics of specific variety with distinctive illustrations.

Training on quality EGS production to seed producer groups and private seed companies in Sagaing region

A one-day quality EGS production training course was organized to equip the seed producer groups in Sagaing Region with seed production and seed quality control especially on different characteristics of sunflower and chick pea crops on 11 February, 2020 in Monywa. A total of 33 participants benefited from the training course.

Seed business model training to the seed farm managers

A 3-day seed business model training was organised for Seed Farm Managers at Agricultural Extension and Rural Development Center (AERDC), Yezin, Nay Pyi Taw during the 17-19 August 2020. The objective was to strengthen the capacity of Seed Farm Managers to run seed business in profitable way in longer term in competing with different seed companies. A total of 45 participants from DOA and DAR from different States and Regions had improved their knowledge and skills on seed business, seed value chains and EGS production, seed quality control and seed sector governance, plant breeding and varietal use as well as seed laws and regulations. During the training the participants actively discussed about their challenges to run the seed farms in order to comply with the government's rules and regulations.

Training of trainers (TOT) on data entry and data management in the digital seed demand forecasting

Global New Wave company (digital seed demand software developer) and WUR jointly conducted an on-line TOT training to DOA staff on the usage of the digital demand forecasting system and how to entry the data was organized on 10th September 2020 with 16 participants from Seed Division (DOA), Yezin Agricultural University and DAR. These 16 trainers will train to their respective department for data entry. Similar training targeted for several seed producers and seed companies could not be organized due to the mobility restrictions as resulted from COVID-19. On-line training was found as not feasible and practical at the seed producers level.

4.3 Seed business development

The third planned outcome of the ISSD Myanmar programme is the increased local availability and uptake of quality seed at affordable prices for smallholder farmers. This component was coordinated by WHH and mainly focussed on strengthening the capacity of private seed producers (seed producers and seed companies) in the Sagaing and Mandalay region. In table 4, we have provided the key outcomes and outputs against the target indicators for component 3 in 2021.

Table 4. Key outcomes and outputs against the project targets for component 3 in 2021

Indicator	EOP target	2018 result	2019 result	2020-2021 result	Total	% EOP reached	
OUTCOME 3: Increased local availability and uptake of quality seed at affordable price to smallholder farmers							
Volume of quality seed produced (MT)	3,375	482	2,016	4,038	6,536	194%	
# of persons (male/female/youth) reached/trained with improved technology and skills in seed production							
Direct	Female	16	13	13	13	81%	
	Male	170	119	119	119	70%	
	# <35	60	52	52	52	87%	
	Total	186	132	132	132	71%	
Number of new improved and well-adapted varieties used by farmers in selected townships	28	11	20	24	24	86%	
Total number of farmers reached							
Direct	Female	36,224	5,780	10,371	22,435	38,586	107%
	Male	39,326	6,262	11,414	24,383	42,059	107%
	# <35	35,673	5,597	10,021	21,405	37,023	104%
	total	75,550	12,042	21,785	46,818	80,644	107%
Total number of hectares of farmland reached	63,067	5,335	20,105	44,352	69,792	111%	
# of functional local seed businesses directly supported by the programme	60	62	72	72	72	120%	
Increased performance (average % increase in indicators) of local seed business in key performance areas	20	0	35	55	55	140%	
# of local seed businesses supported by partners	120	0	311	311	311	259%	
# of partners supporting local seed businesses	4	0	1	1	1	25%	
# of domestic seed companies supported by the programme	6	3	4	4	4	67%	
Increased performance (average % increase in indicators of domestic seed companies) in key performance areas	25	0	15	25	25	100%	
# of field demonstrations established by local seed businesses and seed companies	60	13	24	62	62	103%	
# of field demonstrations organised by Dutch seed companies	6	0	3	2	3	50%	
# of joint activities between the programme and Dutch seed companies	2	1	1	0	2	100%	
# of family farms with increased productivity and/or income							
Direct	Female	36,224	5,780	10,371	22,435	38,586	107%
	Male	39,326	6,262	11,414	24,383	42,059	107%
	# <35	35,673	5,597	10,021	21,405	37,023	104%
	total	75,550	12,042	21,785	46,818	80,644	107%

4.3.1 Establishment of viable local seed businesses

Seed production and sales

For the period 2017-2020 we achieved 6,536 metric tons of quality seed production for the combined years. The 6% of unsold seed in 2020 was a result of the Covid-19 related mobility restrictions. Otherwise, the project end target was to produce 3,375 metric tons by 2020. The substantial higher result in 2020 was a consequence of the increased capacity and scaling partnership with local seed businesses and private seed companies. Hence, we achieved 94% more than our initial seed production target. A total of eight crops and 36 improved varieties were under seed production in the period 2017-2020. A total of 72 seed producers supported by WHH, four domestic seed companies and 311 seed producer under the scaling partnership were involved in seed production in the Sagaing, Mandalay, Bago and Nay Pyi Taw regions in the 2017-2020 period. Covid-19 impacted mainly in the months of May-July for the rice crop. This resulted in 313 metric ton less volume of rice seed production than the initial plan. In addition, a total of 230 metric ton of rice seed remained unsold also a result of mobility.

Table 5. Seed production and sales data for 2018-2020 in Sagaing, Mandalay, Bago and Nay Pyi Taw region

Crop	# of varieties	Year	Seed production area (acres)	Seed production volume (baskets)	Seed sales volume (baskets)
Rice	13	2018	183	18,278	17,763
		2019	1,127	91,959	91,626
		2020	2,008	177,791	166,781
Chickpea	8	2018	181	2,347	2,347
		2019	219	2,509	2,509
		2020	283	5,141	5,141
Green Gram	2	2018	52	607	518
		2019	18	176	176
		2020	111	2,564	2,564
Groundnuts	2	2018	17	337	337
		2019	15	325	325
		2020	46	1,529	1,529
Sesame	6	2018	16	92	92
		2019	24	191	191
		2020	149	1,220	1,220
Black Gram	2	2018	1	3	3
		2019	0	0	0
		2020	21	315	315
Sunflower	1	2018	0	0	0
		2019	2	100	100
		2020	192	1,344	1,344
Pigeon Pea	2	2018	4	1	1
		2019	0	0	0
		2020	7	35	35
Total	36		4,676	306,864	294,917
		2018	454	21,665	21,061
		2019	1,405	95,260	94,927
		2020	2,817	189,939	178,929
Total (tons)				6,536	6,306

Table 6. Varieties produced in 2018-2020 in Sagaing, Mandalay, Bago and Nay Pyi Taw region

Crop	Varieties produced
Rice (14)	90 days, Ayar Min, Lao Sticky Rice, Manaw Thu Kha, Paw San Bay Khar, Paw San Yin, Pyi Taw Yin, Shwe Manaw, Shwe Thwe Yin, Sin Thu Kha, Super Hnan Khauk, Thai 90 days, Thai 100 days.
Chickpea (8)	CA 0224, Yezin 3, Yezin 4, Yezin 6, Yezin 8, Yezin 11, Yezin 12, Yezin 13
Green Gram (2)	Yezin 11, Yezin 14
Groundnuts (2)	Magwe 16, Sinpadathar 11
Sesame (6)	Magway 1, Magway 13, Magwe Smote Net, Sin Yadanar 3, Sin Yadanar 14, Yezin 14
Black Gram (2)	Yezin 7, Yezin 14
Sunflower (1)	Suryakiran
Pigeon Pea (2)	Yezin 8, Yezin 14

The scaling partnership of the DOC with the ISSD Myanmar Programme

ISSD Myanmar engaged with the Department of Cooperatives to undertake outscaling activities in 2019 and 2020. Through the partnership a total of 311 seed producers from 16 townships in Bago and Nay Pyi Taw were supported in quality seed production. The data on total seed production by these seed producers are integrated in tables 4 and 5.

Strengthening the seed producers’ cooperative unit within MOALI

The DOC, with support from the ISSD Myanmar programme, established a new seed producers’ cooperative unit (SPC Unit) in Nay Pyi Taw in 2019 to coordinate and provide long-term support to the SPCs in Myanmar. In 2020, our programme staff was embedded in the SPC Unit at DOC, providing training and orientation to the SPC DOCS staff.

In 2021, we finalized the SPC management guidelines. The guidelines prescribe how seed producer cooperatives can be established and provide tools how to improve their performance. The guidelines include a standardized by-law for SPC management in Myanmar. DOC has received a World Bank loan to further strengthen the SPCs.

Strengthening of seed producers in their business operations

Due to the mobility restriction and social distancing measures imposed by Covid-19, large group trainings were minimized. A model of smaller group training was implemented. In 2020, a total 165 seed producers from ten townships benefited from these type of trainings on: quality seed production and seed business management.

Quality seed production manuals

Based on the trainings and experience-sharing missions, we have finalized quality seed production manuals for chickpea, green gram, sunflower, sesame, and groundnut crops in 2021. The seed production manuals provide detailed guidelines for breeder, foundation, registered and certified seed production, information on varieties that are most demanded by farmers, and information on the common diseases and pests of these crops. These manuals will be immensely useful to both the breeders and seed producers in Myanmar.

Establishment of field demonstrations with new varieties

A total of 62 new improved variety demonstration plots were conducted by seed producers and domestic seed companies to create awareness and increase uptake of quality seed by farmers. A total of 30 new improved varieties (11 varieties of rice, 8 varieties of sesame, 7 varieties of chickpea, 2 varieties of groundnut, 1 variety of green gram, 1 variety of pigeon pea) were demonstrated in the field. A total of 9,300 farmers visited the field demos.

Partnership with domestic seed companies

We further strengthened our partnership with four domestic seed companies. We provided training and coaching to the seed companies. In addition to this, we facilitated long-term EGS contracting with DAR and domestic seed companies for the coming five years. This aimed to guarantee sufficient availability of EGS for the seed companies, so that they can better plan for their commercial seed production. One of the seed companies

supported by ISSD, Green Growth Generation (3G), received a grant from the USAID-ACDI/VOCA project for pulses and oilseeds production in the Dry Zone.

Partnership with Dutch seed companies

In addition, we organized a partnership project with East-West Seed company on hybrid bitter melon and yard-long bean seed production in 2019 and 2020. In this project, five farmers were trained on seed production, by East-West, and the fields of the five farmers were used as demos for additionally interested farmers. As such, we also jointly organized a field day in Nay Pyi Taw with 70 farmers participating. In addition, the two varieties were registered at DAR for Plant Breeder's Rights. The pilot will further increase the position of Myanmar as a major vegetable seed production country. At the time we were also in touch with other Dutch seed companies that were interested in investing in seed production activities in Myanmar.

We collaborated with the Dutch Topsector on a potato project that supported pre-commercial trials of two hybrid potato (true potato seed) varieties in Heho. Two private seed companies, Bejo and Solynta, partnered in this project and provided planting material, and technical and backstopping support. The ISSD Myanmar team from DOA provided support for the import process and legal requirements.

Workshop on key achievement of seed business development

Our consortium partner WHH organised an online workshop on 28 December 2020 to share the key results and achievements made by ISSD Myanmar with respect to the development of local seed business in the Dry Zone of Myanmar. A total of 67 representatives of the Union DOA, DOC, Regional and Township DOA, seed companies and seed producers and NGOs participated in the online meeting.

Seed producers and seed companies performance assessment

We organised a survey in November 2020 under four private seed companies that were supported by the programme since 2018 in order to measure performance and satisfaction in four areas: being technically well equipped, market-oriented, professionally well organized, and strategically linked. The survey found that the programme contributed to major improvements in the area of being technically well-equipped, with a 38% increase compared to the baseline, followed by market orientation (33% improvement), strategic linkage (16% improvement) and professionally organised (12% improvement). The average of the four areas was a 25% improvement in performance compared to the baseline.

Similarly, we conducted a survey under 68 seed producers who were directly supported by the programme since 2017. The survey was organised between the first week of December 2020 and the third week of December 2020. The survey found a 40% to 75% improvement in four key performance areas within the programme intervention within a three year period.

Uptake of quality seed by farmers

We reached a total of 80,644 farmers in the period 2017-2021, which was 20% more than our target of 75,500. Importantly, through intensive training and coaching, these seed producer cooperatives improved their performance by 55% (compared to the baseline of 2017 and taking into account the four areas seed business performance).

Calculations of the number of farmers reached was based on seed sale volume for each crop, the seeding rate used by farmers, and the average crop area of a family farm. The use of quality seed of improved varieties covered an additional of 69,792 ha of crop land in 2020.

4.4 Programme management and coordination

4.4.1 Facilitation of project coordination, planning and field monitoring

On an annual basis, the ISSD Myanmar programme organised on average three quarterly programme review and planning meetings, and one annual review and planning meeting, with all programme consortium partners and staff. These meetings were all organized online as travel to and within Myanmar got restricted from March 2020 onwards. These activities contributed to increased coordination, communication and problem solving in the implementation of programme activities.

5 Sustainability

We worked on seven priority areas for seed sector development in the Dry Zone important for programme sustainability. Here we sum up the effectiveness of these approaches.

Improved private sector role and policy advocacy: The achievements made in 2017-2021 included the further professionalization of the MSA as a representative of the private seed sector in Myanmar. ISSD Myanmar supported the recruitment of an Executive Secretary. In addition, ISSD Myanmar assisted MSA in the finalization of a five-year strategic action plan. All ingredients are in place now for the MSA to emerge as an active association that can represent and provide quality services to its members.

Improved seed sector coordination: Covid-19 and the coup in February 2021 meant that we were unable to organize a final biannual national seed sector platform meeting. The aim was to have the DOA and MSA take over the organisation of the platform meetings. But because of the ongoing political situation in Myanmar we were unable to organize the final platform meeting, and no collaboration with the Myanmar government is possible any more at the moment.

Alternative business models for EGS production: With DAR, we completed a long-term forward contracting agreement for EGS supply with three domestic seed companies. This allows private seed companies to plan their seed production with greater levels of certainty for up to five years as there is a guaranteed volume of EGS provided by DAR combined with technical training and coaching. In addition, we finalized a pilot on an alternative seed farm development model at two DOA farms. This pilot is now completed, and we expect the two seed farms to consistently increase their productivity due to investments in supplementary irrigation.

Digital EGS seed demand and forecasting systems: We scaled up the mobile based technology for Dry Zone crops in 2020 and 2021. The digital system brings public seed farms, seed companies, seed producers and farmers together on one platform to enable real-time estimates for demand and supply for different varieties and seed classes. The system was launched in 2020 for the Dry Zone and can run independently now.

Economy of scale for local seed businesses: We worked with the DOC to establish a separate seed producer cooperative unit, which provides legal registration and long-term institutional support to thousands of informally organized small-scale seed producers. The DOC has already put six fulltime staff in the new SPC unit and ISSD Myanmar has seconded one fulltime senior advisor to support the SPC unit staff. The SPC management guidelines (and standard by-law format) were finalized in 2021.

Seed regulatory reform: The ISSD Myanmar programme continued to partner with the IFC/World Bank's 'Inputs Reform Project'. We supported the development of guidelines for risk-based (and farmers' complaint-based) inspections and supported the trainings for MOALI (DOA) staff on implementing the guidelines.

Inclusiveness: Throughout the programme much attention was paid to inclusive business development, targeting small-scale seed producers and larger seed companies as well as youth and women.

Additional priority areas

The concept of a 'Myanmar Seed Partnership' programme emerged during 2020. As part of the Myanmar Seed Partnership initiative a 'Myanmar Seed Valley' was included, alongside other initiatives like an independent variety testing and training service. The plan was to establish a hub for seed companies to produce and process seed, as well as to test and demonstrate new varieties. In 2020 these ideas were further discussed with MOALI and several seed companies. But because of Covid-19 travel restrictions and the February military coup an anticipated field day at the Hlaingtet Central Seed Farm (FVRDC) had to be cancelled. The concept and plan are still very relevant, and we hope that it can be revitalized when the political situation of the country improves.

6 Risks

Climate change: The main risks for project implementation centre around the volatile climatic conditions of the Dry Zone. Due to climatic change there are increased incidences of droughts *and* floods that affect both crop and seed production. Supplementary irrigation will become increasingly important for the Dry Zone, and the ISSD project has assisted in support for seed farms and seed producers to invest in this.

Volatile export market for pulses: The Myanmar Dry Zone is the main production hub for pulses. Many pulses are grown both for commercial export as well as domestic consumption. But regularly changing import restrictions in the main export market of India are reducing incentives to invest in quality seed, especially black gram and pigeon pea.

7 Finance

Presented in a separate document.

8 Lessons learned

We learned that the integrated nature of the project is well appreciated by the Myanmar government and private sector. Working on both systemic bottlenecks in the enabling environment (such as quality EGS provision and improving the seed business climate) and training activities on the ground (supporting seed farms, seed producers and seed companies), was of considerable help in developing a more vibrant public-private seed sector. Strong relations between government experts, seed farms and seed producers also helped significantly in improving quality seed production (the volume of seed), seed quality (genetic and physical purity / certification) and the varieties portfolio (ensuring a greater choice for farmers and the introduction of new varieties).

In terms of increasing seed production by seed producer cooperatives and seed companies, the project has been very successful. The project exceeded its own targets in terms of tons of seed produced and number of farmers supported. The main reason for its success was the strong collaboration with the district and township offices of agriculture and their departments of cooperatives. In addition, the approaches and tools (based on the local seed business model developed in Ethiopia and Uganda) fitted the Myanmar reality well, providing emphasis not only on production activities, but also on aspects of internal management, sales and marketing, and strategic partnerships. Through embedding the seed producer cooperative guidelines within the department of cooperatives at union level, we hope and expect that this success can be replicated by the government itself.

Despite the outbreak of Covid-19 in 2020 we were still able to implement many activities. Our team on the ground, both in Nay Pyi Taw and Sagaing, was able to continue training activities for DOA and DAR staff as well as seed producers and seed companies. The military coup that started in February 2021 however had far-reaching consequences on the further embedding and development of the programme's seed sector activities. We were unable to further scale out DOA seed farm pilots, or to implement variety use agreement models with DAR. As a result, most activities in 2021 focused on documentation of lessons learned, in particular the institutional innovations related to the seed producer cooperative model and guidelines, the quality seed production manuals, scaling the digital seed demand forecasting system, and strengthening the MSA. For each of these topics dedicated reports/guidelines were developed that are accessible on the ISSD Myanmar website, or on request from abishkar.subedi@wur.nl

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