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Seed Info

Official Newsletter of the WANA Seed Network

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ICARDA
Science for resilient livelihoods in dry areas

Editorial Note

Seed Info aims to stimulate information exchange and regular communication between seed staff in the Central and West Asia and North Africa (CWANA) region and beyond. Its purpose is to help strengthen national seed programs and, in turn, improve supply of high-quality seed to farmers.

WANA Seed Network News reflects on the three decade-long journey of the *Seed Info* newsletter, following its inception in June 1991. In January 1994, the newsletter twinned with the publication '*Focus on Seed Programs*', which provided more detailed and extended information on the state of national seed programs in countries in the West Asia and North Africa regions. A further notable milestone was when *Seed Info* was endorsed as a newsletter of West Asia and North Africa (WANA) Seed Network, which was established in 1996 by the Seed Unit of ICARDA. Between 1998 and 2012, we produced an Arabic version of *Seed Info* to reach a wider audience in the Middle East. In 2012, the newsletter pivoted to become an online publication.

In the **News and Views** section, we present an article by Niels Louwaars from the Dutch Seed Trade Association on *Seed Enterprise Development and the Public Sector*. In the final decades of the Twentieth century, significant investments were made by both governments and donor organizations to develop public seed production infrastructure in many countries. These increased the varieties developed at national agricultural research institutes, often in close cooperation with CGIAR centres, with extension services often tasked with seed distribution. In this newsletter, we also present news from regional and international organizations, including the Food and Agriculture Organization of the United Nations (FAO), the West African Council for Agricultural Research and Development (CORAF), the International Seed Testing Association, and the International Union for the Protection of New Varieties of Plants.

The section on **Seed Programs** shares news from Ethiopia, Iran, Turkey, and Uzbekistan. For example, we highlight the consultation meeting organized by the Ethiopian Institute of Agricultural Research regarding the revitalization of early generation seed production in the country, which brought together stakeholders from the seed value chain – including federal and regional agricultural research institutions, federal and regional public seed enterprises, and private seed companies including seed producer cooperatives. We also report on the accreditation of the seed testing laboratory of the Seed and Plant Certification and Registration Institute (SPCRI) in Iran. Accreditation of such laboratories to the International Seed Testing Association offers a range of benefits to members, and to sellers and buyers in the international seed trade and market. In most countries, the importing/exporting of seed lots is only permitted when are accompanied by an ISTA certificate – making Iran one of the few countries in the Central and West Asia and North Africa regions with accredited laboratories.

The **Research** section of *Seed Info* relays information on research activities or issues relevant to the development of seed programs in the CWANA region and beyond. We feature a paper on the management of lentil diseases in the MoretinaJiru, SiyaDeberinaWayu and Aleletu districts in Central Ethiopia, as part of an Africa RISING project funded by the United States Agency for International Development (USAID) and implemented in partnership with ICARDA.

Seed Info stimulates the exchange of information among national, regional, and global seed industries.

Happy New Year!

Zewdie Bishaw, Editor

WANA Seed Network News

This section presents information about the WANA Seed Network, including network activities and reports from meetings of the Steering Committee and the WANA Seed Council.

Seed Info: A Journey of Three Decades

The first issue of *Seed Info* was released almost 30 years ago, in June 1991. In June 1994, it twinned with the publication '*Focus on Seed Programs*', which provided more detailed and extended information on national seed programs in specific countries – the first being Morocco and the last was on Afghanistan in 2011. Another milestone was reached when *Seed Info* was endorsed as a newsletter of West Asia and North Africa (WANA) Regional Seed Network, which was established in 1996 by the Seed Unit of ICARDA. The Network's main objective was to bring together the national seed programs of countries in the WANA regions where ICARDA operates (later including Central Asia), facilitate easy movement of varieties and seeds across borders, and create an integrated common regional market.

While the format and content of the newsletter has evolved over the years (including an Arabic version published between 1996 and 2012), it has remained steadfast in its aim of informing readers on issues of seed sector development in Central and West Asia and North Africa region and beyond. Before it pivoted to being online-only in 2012, printed copies of the newsletter were sent to thousands of active subscribers in over 100 countries across Africa, Americas, Asia, Australia, and Europe.

Many Centers supported the seed sector development in their own ways for their respective crops and mandate regions, but ICARDA is unique among the CGIAR Centers, as it has had a unit dedicated to seed activities since its establishment in 1985, thanks to a project financed jointly by the governments of Germany and The Netherlands. While the seed system issue sits at the intersection between research and development, some have questioned ICARDA's focus on its Seed Unit believing this to be more of a developmental than research issue. From the outset, ICARDA recognized the strong interface between crop improvement and seed systems and the complexities of moving technologies to farmers in the dry environments of its mandate regions. While the organization's seed work initially focused on strengthening the capacity of national seed programs and information sharing, it gradually extended into broader areas of seed sector development. At the same time, it began collaborating with global and regional organizations working on seed sector development, such as the FAO, the OECD, the ISTA, UPOV and the International Seed Federation (and its regional members such as the African seed Trade Association and the Asia Pacific Seed Association). ICARDA also worked with capacity development and academic institutions such as the Wageningen Center for Development Innovation of Wageningen University and Research, contributing to its annual seed courses, and with Jordan University (Jordan) and Dicle University (Turkey) in developing the curriculum of seed technology.

Furthermore, ICARDA supported countries in their efforts to build and diversify their national seed systems: (i) frame seed policies and regulatory frameworks; (ii) advocate for the entry and participation of private sector actors; (iii) advocate for formation of regional and national seed associations; (iv) establish viable business models for less commercial crops; and (v) recognize the role of the informal sector in seed supply. The organization also ventured into (i) emergency seed relief operations to rehabilitate the agricultural sector in fragile states; (ii) advocated for regional harmonization to enable seed security during both emergencies and normal times; and (iii) supported the massive scaling of improved crop varieties and integrated crop management technologies through partnerships with research for development partners to create impact at scale.

Seeds act as conduit through which agricultural innovation can be delivered to farmers – and their availability, access, and use is crucial in increasing agricultural production and productivity, ensuring food security, and improving farmers' livelihoods. However, national seed systems operate under heterogeneous environments in terms of agro-ecology, farming systems, crops, and markets, and there are no uniform solutions.

As such, ICARDA advocated for an Inclusive Seed System (ISS), aimed at developing a vibrant,

pluralistic, market-oriented, and harmonized seed sector which provides farmers across the CWANA Region with access to climate resilient, productive varieties. The guiding principles of the ISS are to:

- Recognize the value of formal, intermediate, and informal seed systems, and cherishes the diversity of systems and pathways through which seeds of different commodities are produced, marketed, and exchanged, and used by farmers with different needs.
- Recognize that no 'one system fits all' and that seed sector development should be context-specific based on agroecology, farming systems, commodities, and farmers, bearing in mind socio-economic and political constructs or contexts of countries.
- Recognize the seed value chain approach–from variety development and release to seed production, commercialization, and farmers' seed use – and promotes entrepreneurship whenever possible. This includes the involvement of various types of seed enterprises, from farmer-based small- and medium-sized enterprises (SMEs) serving local needs to multinational companies operating at regional or global levels.

Most countries' seed sector development is significantly improved compared to 20 or 30 years ago, although there remains a long way to go for some commodities.

The last issue of *Seed Info* introduced the *Communities of Excellence on Seed System Development* (CoE on SSD) initiative, a catalytic process designed to establish a community of experts and a forward-looking strategy that places seed system development squarely on the One CGIAR research-for-development agenda. The process is a bottom-up engagement initially nested within the Consultative Group on International Agricultural Research (CGIAR) but is set to expand to a much wider set of agri-food system stakeholders. Launched as a result of an IFPRI initiative and with support from The Netherlands, it is highly gratifying to see a wealth of expertise and experience – from biophysical to social scientists working in crop seeds, planting materials, livestock breeds, and fish fingerlings – being brought together.

With One CGIAR going into full gear in 2022, the seed system is capturing the attention of many, including donors, development practitioners, and policy makers. From CoE on SSD to the new CGIAR initiatives on seed systems (SeEdQUAL), the future looks bright for taking genetic innovations to farmers' fields and achieving impact at scale provided the diversity and inclusivity of seed systems is recognized and managed properly. To bring impact at scale in the research for development continuum, an enabling policy environment, the correct technology, and the right partnerships are all required.

Despite the many discussions and concerns regarding inclusivity and equity, developmental or commercial interests, and formal or informal sectors, the core principles of seed systems remain the same:

- Whether occurring at local level during farmer to-farmer exchanges (where transactions take place as cash sales) or within community networks as barters among fellow famers, the seed business is a commercial operation. Today's large-scale operations at national, regional, and global levels are a reflection of the transformation from tradition to modernity. There is always a motive to make a profit to be sustainable.
- The seed system's core function is providing farmers with the correct quantities of seed; ensuring availability and use; supplying the right quality seed in terms of genetic, physical, physiological, and health quality; and providing seed at the right place and time, and at a reasonable price – be it for SMEs at a local level or multinational companies at a global level. Proximity to clients matters!
- Seed sector development is not characterized by revolutionary change, but rather as an evolutionary process that builds on experience gained and lessons learned over time. This evolution took over a century to unfold in the industrialized world, while seed programs in developing countries were triggered by the Green Revolution – with few exceptions and

quick movement. However, the trajectory of developing countries' progression is very much influenced by the commitment of national governments in creating a conducive enabling environment.

Turning attentions back to *Seed Info*, many people have contributed to the newsletter over the years, for which I am indebted to as an editor. However, I would like to particularly mention Niels Louwaars, who has been a regular contributor to the Views and News Section, touching on broader issues from genetic resources to gene editing technology as it relates to the seed sector.

There is a beginning and an end to a journey, however short, long, or successful. As such, the time has come to retire *Seed Info* and this issue will be the last. I would like to thank you all from the bottom of my heart for your company along this journey.

Editor's note

As I conclude this chapter please allow me to leave you with a personal reflection from Dr Michael Turner who contributed an interesting piece some years back which is relevant to seed system today as it was then in 2017 to the Agriculture for Development Magazine.

Thank You	Gracias	Obrigada	Asante
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News and Views

News, views, and suggestions relating to the seed industry are included in this section, providing a forum for discussion between seed sector professionals.

Seed Enterprise Development and the Public Sector: Pathways for Less Commercial Crops

Taking place in November 2021, FAO's "Conference of the Green Development of Seed Industries" comprised an important session on seed enterprise development. In the final decades of the Twentieth century, significant investments from both governments and donor organisations (such as FAO) were made in order to develop public seed production infrastructure in many countries. These increased the varieties that were developed at national research institutes, often in close cooperation with CGIAR centres, and extension services were often tasked with distributing such seeds.

Supporting seed enterprise development

The professionalization of seed production in the Organisation for Economic Co-operation and Development (OECD) countries was initiated by small seed enterprises and farmer-cooperatives specializing in seed production, processing, and marketing. These gradually developed into (inter-) nationally operating seed enterprises.

Many public seed production and distribution systems in the global south have been privatized under structural adjustment policies. These shifts saw many national governments put greater focus on policy, legislation, and finances, rather than actual production activities. Some countries sold off their seed production facilities to multinational companies, while some split them up for takeover by national investors; yet others kept them intact but distanced them from government operations. At the same time, local and foreign investors and seed companies were invited to create a competitive private seed system. In several instances, this meant that seed production became increasingly concentrated on crop seeds that can be sold at a good price, such as maize, and breeders had to find other ways to popularize varieties of minor crops, such as small grains and legumes.

The FAO conference highlighted examples on how support to systems for seed enterprise development is implemented in different countries – such as the introduction of tax holidays and other financial support mechanisms; the creation of access to seed processing facilities or importation of small-scale conditioning equipment; and the provision of training in seed entrepreneurship, including business plan development; and advocating for effective plant breeder's rights, which not only supports breeding but also investment in seed market development, etc. More recently, the establishment of farmers' seed cooperatives has been touted as an approach for dealing with seeds that have lower profit margins, as these allow for lower overhead and transport costs. In turn, adapted seed quality procedures and standards, often under the term "quality declared seed" are introduced. In all examples, long-term coherent policies were stressed as being essential for the success of such interventions.

Public sector

Within seed systems, effective linkages between public research and breeding are key, as there are a limited number of crops that have profit margins

which allow for sufficient investment in breeding. Therefore, public funds – either in public-private cooperation programmes, or in public breeding institutes – are essential. A major challenge posed by public breeding is the setting of breeding objectives. In many countries where extension systems are impacted by funding shortages and training limitations, it is difficult for researchers to obtain feedback from farmers and there is often low adoption of new varieties. The most scientifically challenging issues, such as complex tolerances to abiotic stresses, may not be the essential varietal characteristics for farmers. My own experience in Uganda included having a breeding goal focused on the beans' cooking time, rather than disease resistance or seed types selected by breeders. A close link, between breeders who develop varieties and seed producers hat know their farmers very well, is key. In the absence of such seed companies, the challenge is even greater, and breeders rely on feedback from demonstration plots and other participatory approaches.

Furthermore, many countries are severely limited by poor supply of early generation seed to various seed multipliers. Maintaining a variety true to type and producing high quality seed is not always sufficiently rewarding for a breeder who wants to release new varieties and publish articles. However, without such actions, the varieties don't reach farmers and breeding is futile! This is very well understood in private sector breeding: without sales, there are no funds for the breeding program. As a result, the public institutions at which breeding occurs, urgently need to find a sustainable solution. Breeder's rights can also help; as when a new variety is available for all seed producers, none are likely to invest in them. Popularizing a new variety requires significant effort, and if any competitor can capture the market once a variety becomes popular, nobody will invest. However, public breeding institutions should be extremely careful in using breeder's rights to obtain significant income, as doing so would likely shift the focus of breeding to the most profitable crops and the most commercial farmers, which may not be the government's priority.

Concluding remarks

The FAO conference brought together different components of the seed chain. It showed that policy is highly relevant at seed system, breeding, genetic resources, and technology levels. It is positive that FAO is regaining an interest in the seed sector, but how the organization will use the outcomes of the conference – particularly in the development of seed enterprise – remains to be seen.

For those interested in the outcome of the conference, you may find further information at the FAO Website

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FAO's Green Seed Industry Conference

The Global Conference on Green Development of Seed Industries was organized by FAO to provide a neutral forum for its members, partners, industry and opinion leaders, and other stakeholders to engage in focused dialogues on how best to make quality seeds of preferred productive, nutritious, and resilient crop varieties available to farmers. The online event, held between 4-5 November 2021, generated evidence for actions towards the realization of the goals of FAO's Strategic Framework 2022-31: for the transformation to more efficient, inclusive, resilient, and sustainable agri-food systems for better production, better nutrition, a better environment and a better life, thus contributing to achieving the United Nations' Sustainable Development Goals (SDGs), especially SDGs 2 and 1.

During the event, several contributing partners collaborated to deliver 22 insightful and contemplative sessions to an audience of roughly 500 global peers. Overall, the objectives of the conference were to:

- Increase awareness of contributions by the seed industry to green innovation of plant production.
- Promote cooperation between sectors, especially public-private partnerships.
- Foster priority setting and the targeted mobilization and pooling of scientific, technical, and financial resources for strengthened seed systems.
- Debate evidence and share updated knowledge about green development of the seed industries.

The conference addressed several themes, including:

Advanced technologies: The reviewing of advances in modern plant breeding technologies, emerging biotechnologies, and informatics technologies, and how they can be used safely and efficiently to enhance the delivery of genetic gains to farmers. Importantly, the conference also facilitated a stocktaking of available tools.

Conservation of plant genetic resources for food and agriculture: The development of a forum to review knowledge regarding crop diversity, its

conservation and availability, and its underpinning role in resilient and sustainable agri-food systems. The forum will also explore how the use of crop diversity may be positively influenced through a wide range of actions taking place in situ, on-farm, or ex-situ as part of an interdependent global system.

Crop varietal development and adoption: The conference offered a unique opportunity to review select case studies and identify the drivers of success. Particular attention was paid to the validated means for the deployment of scientific progress in nurturing environments that permit mutually beneficial partnerships amongst the multiplicity of actors.

Seed systems: Exploration of what has worked in transforming ineffective systems into responsive and dynamic ones which provide solutions required by farmers so successes can be replicated. The roles of international seed trade and the requisite harmonization of legal frameworks were explored, especially in the context of solutions that work for the production systems of small-scale farmers.

Policy and governance: Exploring the enabling environment – at national, regional, and global levels – for seed systems and the associated upstream domains of germplasm conservation and plant breeding.

A playlist of the session recordings is available here.

The West Africa Agricultural Technology Fair: A Call to Action

Background

The West Africa Agricultural Technology Fair (WATEF) is a partnership event organized by Technologies for African Agricultural Transformation (TAAT) and CORAF. Its aim is to showcase TAAT's agricultural technologies, along with those from CORAF's National Centers of Specialization/Regional Centers of Excellence (NCoS/RCE), in order to open avenues for their brokerage, uptake, and mainstreaming towards agricultural transformation and socio-economic development in countries in the West and Central Africa region.

Observations and call to action

The event was successful in bringing together a wide range of partners to view and discuss various technology products. Several key points and actions for implementation were identified, such as:

1. The presence and participation of private sector and government officials is not as strong as desired. Special efforts need to be made in engaging the private sector for such events, such as through Chambers of Commerce and other private sector associations at region or country levels. Similar efforts need to be made in engaging governments through the Economic Community of West African States (ECOWAS) and its inter-ministerial council. TAAT and CORAF are called upon to initiate such engagement for future events.
2. It was felt that most technologies exhibited are still at the pilot or prototype stages of testing. There is a need to move beyond technology development to place greater emphasis on mainstreaming proven technologies within national and country programs for creating impact at scale.
3. There is a need to move beyond development of pilots, prototypes, and paradigms, and head towards large-scale technology mainstreaming. Programs such as TAAT, TARSPro (Agricultural Technologies and Innovations Scaling Up Project for Increasing the Resilience of Production Systems and Family Farms in West and Central Africa) and NCoS need to make a bold move in this direction.

In this respect, the following actions are required:

- **Technology profiling**: This should involve assessment of various technologies to determine their scaling readiness and economic/social potential and sustainability. Return-on-investment analysis which showcases small-, medium-, and large-scale investment opportunities also needs to be undertaken. A good example of this is TAAT's catalogues on various commodities. However, policy brief versions of these documents need to be created for policy makers.
- **Certification**: A rigorous certification process must be in place to guarantee the efficacy, quality, and safety of technology. Such a process could be linked with government controlled processes, wherever they exist. CORAF and TAAT should collaborate in this regard.
- **Private sector engagement**: Technologies deemed to be certified as scalable need to be taken through the brokerage process; which involves linkages to the private sector. Special strategies should be embarked upon in relation to engaging with the private sector in this brokerage activity, including mobilization of resources from the private sector in support of technology brokerage. Programs such as TAAT and CORAF's NCoSs should work with

governments to create an enabling environment in which the private sector can flourish.

- **Government engagement**: A key element of technology brokerage is engagement with the government and mainstreaming of the technologies into government programs. This should include mechanisms for involvement in country loan programs from development banks. The proven, tested, and certified technologies must be well-profiled and packaged for their incorporation into country loan programs and other initiatives.
- **Intellectual property rights on publicly-funded technologies**: The issue of intellectual property rights (IPRs), as they relate to private sector uptake of technologies which are developed through public sector support as public good products, need to be further analyzed. A special expert group meeting or consultancy may need to be established to deliberate and provide guidance on this.

In this respect, the following recommendations are proposed:

- The transition of CGIAR centers into a One CGIAR entity is appreciated. The creation of the West and Central Africa regional program under One CGIAR is noted, and the expansion of focus to include delivery, dissemination, and scaling of its technologies is particularly supported.
- TAAT, in its next phase of operation, needs to adopt a strategy based on technology brokerage and expand its operations in mainstreaming technologies into country programs and loan packages. This should include establishing strong links with the Development Banks in this respect.
- The NCoS/RCE model has excellent potential for expanding technology brokerage and the regional sharing of expertise and resources. Strong support is required for these initiatives to be well established at both country and regional levels of engagement. This is especially the case in relation to the functioning of the regional responsibility dimension of the responsible National Agricultural Research Systems (NARS) and RCE.
- With regard to TAAT Compacts (separate projects under TAAT) and the NCoS, there is a need to strengthen the delivery of technology by de-risking uptake and ending hesitancy on technologies. TAAT, through its Compacts, should establish partnership agreements and operations with respective NCoS/RCE, as this will enhance synergy and help regionalize efforts.
- Efforts should be made to reconcile and link the technology profiling platforms of CORAF (MITA) and TAAT (PROPAS) and Catalogues, etc.

Ultimately, the WATF provided a great source of information and allowed for experience sharing across various technology options. However, this needs to be built upon. It is suggested that the future phases of TAAT/NCoS embrace the agronomic gains made and translate these to economic gains at scale. In this regard, there is need to rethink the structure of commodity and enabler Compacts, to ensure that enabling elements for technology function are built within the various commodity programs and compacts.

The Capacity Development and Technology Outreach (CDTO) of TAAT, led by the Forum for Agricultural Research in Africa (FARA), should be repositioned to go beyond the training of stakeholders in technology use, and respond to the longstanding demand of market-driven economic transformation as public goods across the ecologies.

The International Institute of Tropical Agriculture (IITA) and CORAF, under aegis of ECOWAS, and through the instruments of TAAT, FARA, and programs such as the NCoS and TARSPro, are called upon to establish a Task Force for the development of a Strategic Plan for the realization and implementation of the recommendations arising from this Technology Fair.

It was recommended that the first step in achieving this recommendation be in place before end of 2021 and built into work plans for 2022 across all the associated programs. Lead responsibility for this rests with CORAF and TAAT.

Source: *CORAF, 3 November 2021*

News from the International Seed Testing Association

Procedure for ISTA Standard Proficiency Test

The ISTA Standard Proficiency Test (PT) Program define and explain the single steps and framework in which it is operated. However, coverage is limited to PT rounds for purity analysis, other seed determination, germination testing, moisture content determination, viability (tetrazolium test), vigor, and thousand-seed weight test. Seed health proficiency testing, proficiency tests for specific traits (GMO PT), and variety proficiency testing are not described.

ISTA resources

This section combines helpful information on a range of important ISTA documents, seed testing links, position papers, press releases, news about the organisation, and current job opportunities. Under Documents, you may find important content related to ISTA Accreditation, Technical Committees and Proficiency Test.

To read about ISTA views regarding particular technical committee issues, please browse the Position papers section.

For official announcements from ISTA to the media dating back up to three years, visit Press releases.

To subscribe to ISTA's weekly newsletter and receive latest updates about the organisation, go to Newsletter.

Finally, in the Links section, you may browse a range of important links related to the seed industry.

ISTA Publication

The International Rules for Seed Testing 2022 edition is now available online. The following Rules chapters are free to download and can be accessed via the following links:

- ISTA Rules 2022: Introduction
- ISTA Rules 2022 Chapter 1: Certificates
- ISTA Rules 2022 Chapter 2: Sampling
- ISTA Rules 2022 Chapter 7: Seed Health Testing

You can also download the 2022 Seed Health Methods for free.

Online, single-user access to the ISTA Rules set and chapters can be purchased directly from IngentaConnect.

ISTA Reference Pest List

At ISTA, the Seed Health Committee focuses on seed-borne pests (bacteria, fungi, oomycetes, viruses, nematodes) in over 40 non-vegetable species from 21 botanical families of spermatophytes (seed plants), including cereals, legumes, oleaginous crops, forest trees, and fruit trees.

The updated version of the ISTA Reference Pest List now includes alfalfa, and contains 290 seed-borne pests, of which 126 seeds are a pathway of dissemination. For more information about the ISTA Reference Pest List, please visit their website.

ISTA presentation

Ensuring Seed Quality by Uniformity in Seed Testing with up-to-date figures and facts is available on ISTA website, or can be obtained by contacting ISTA at: ISTA, Richtiarkade 18, Wallisellen 8304, Switzerland.

News from the International Union for the Protection of New Varieties of Plants

UPOV membership

The purpose of UPOV is to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new plant varieties for the benefit of society. UPOV is an intergovernmental organization based in Geneva, with 78 members covering 97 states.

The members of UPOV (as of 3 December 2021) include two regional organizations (the African Intellectual Property Organization[1] and the European Union[2]) and 78 sovereign countries (marked in green on map below).

UPOV member countries: The boundaries shown on this map do not imply the expression of any opinion whatsoever on the part of UPOV concerning the legal status of any country or territory.

UPOV membership and secretariat

Ghana accedes to the UPOV: Ghana deposited its instrument of accession to the UPOV Convention on 3 November 2021 and became the seventy-eighth member of the UPOV on 3 December 2021.

Draft Law of Jamaica: The UPOV Council, at its fifty-fifth ordinary session on 29 October 2021, took a positive decision on the conformity of the

[1]Operates a plant breeders' rights system that covers 17 member states (Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, and Togo)

[2]Operates a plant breeders' rights system that covers 28 member states (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom)

New Plant Varieties (Rights of Breeders) Bill 2021, of Jamaica ("Draft Law"), with the provisions of the 1991 Act of the UPOV Convention. Once the Draft Law is adopted with no changes and the Law is in force, Jamaica is allowed to deposit its instrument of accession to the 1991 Act.

Vice Secretary-General: The UPOV Council, at its fifty-fifth ordinary session, extended the appointment of Mr. Peter Button as Vice Secretary-General from 1 December 2022 until his retirement in October 2023. The UPOV Council further approved the procedure and timetable for the appointment of a new Vice Secretary-General.

Developments in UPOV

A video presentation by the Vice Secretary-General on "Report on developments in UPOV", made for the fifty-fifth ordinary session of the UPOV Council, is available at the C/55 webpage, in English, with subtitles in English, French, German, and Spanish.

UPOV seminar

On 20 October 2021, UPOV organized an online seminar on strategies that addressed policies involving plant breeding and plant variety protection (PVP), which was attended by 132 participants, comprised of 45 members of the Union and 13 observers. A video of the seminar is available (in English) on the UPOV website. A video recording of the seminar will also be made available at a later stage in French, German, Spanish, and Russian. The proceedings of the seminar will also be published on the UPOV Website in all UPOV languages.

The UPOV Council agreed to the organization of a seminar in 2022 to explore the role of plant breeding and PVP in enabling agriculture to adapt to, and mitigate, climate change.

Program and Budget for the 2022-2023 Biennium

The Council approved the Program and Budget of the Union for the 2022-2023 Biennium.

Digitization: The program looks to build on digitalization opportunities to transform the level of support that UPOV can provide in the implementation of the UPOV system of plant variety protection.

Further development of the following guidelines of compatible tools (e-PVP) is planned in the 2022-2023 Biennium. These tools will provide coherent and comprehensive assistance in the implementation of the UPOV system of PVP, some or all of which can be used by members of the Union, as considered appropriate:

1. Applying for PVP

- Extending coverage of UPOV PRISMA to more members of the Union and more crops/species.
- UPOV member cooperation platforms (e.g., regional) to cooperate in the administration and examination of applications.

2. Administration of PVP applications

- Electronic PVP administration module for members of the Union to manage and publish PVP applications.
- UPOV similarity search tool for variety denomination purposes based on UPOV-agreed algorithms, running on data in the PLUTO database.
- Enhancement of PLUTO database by increasing the quantity and quality of data included.

3. Facilitating cooperation in distinctness, uniformity, and stability (DUS) examination

- Platform for exchange of existing DUS reports.
- Tool to provide information on cooperation in DUS examination between members of the Union to PVP applicants in a user-friendly form.
- Platform Union members to make their documented DUS procedures and information on their quality management systems available to other members.
- Module for Union members to use the web-based TG Template and database of characteristics to develop individual authorities' test guidelines (IATG) in their language.
- Platform/portal for UPOV member databases containing variety description information.

Rapid advances in machine translation technology have also provided new opportunities, which will be pursued as a matter of priority to help reduce translation costs for UPOV documents and make UPOV materials available in a wider range of languages.

International UPOV qualification: Resources will be increasingly channelled to virtual training programs and re-usable materials, additional distance learning courses, video demonstrations, webinars, and virtual practical guides, in order to reduce the need for *in situ* training and increase outreach. Furthermore, in conjunction with relevant

partners, the development of an international curriculum, leading to UPOV-recognized qualifications, has been proposed.

Use of the Chinese language in UPOV

The UPOV Council approved the use of the Chinese language in the UPOV program and proposed resourcing, including the provision of interpretation services in the Chinese language at UPOV sessions in Geneva.

Adoption of documents

The UPOV Council adopted revised versions of the following documents:

- ***UPOV/INF/6***: Guidance for the preparation of laws based on the 1991 Act of the UPOV Convention UPOV/INF/16: Exchangeable Software.
- ***UPOV/INF/17***: Guidelines for DNA-Profiling: Molecular Marker Selection and Database Construction ("BMT Guidelines").
- ***UPOV/INF/22***: Software and Equipment Used by Members of the Union.
- ***UPOV/INF/23***: UPOV Code System.
- ***TGP/5***: Experience and Cooperation in DUS Testing, Section 2: UPOV Model Form for the Application for Plant Breeders' Rights.
- ***UPOV/EXN/DEN***: Explanatory Notes on Variety Denominations under the UPOV Convention.

All adopted documents will be published in the UPOV Collection (see http://www.upov.int/upov_collection/en/).

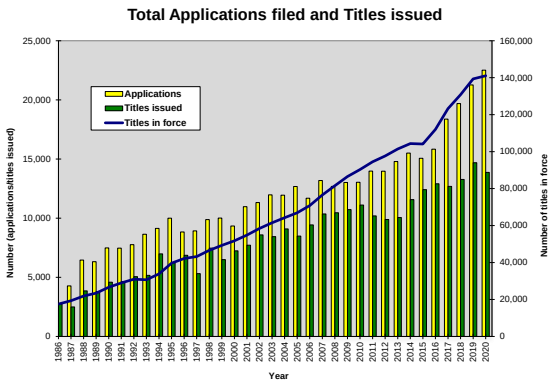
PVP Statistics

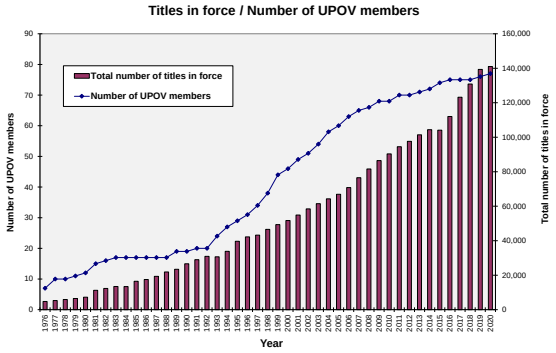
The number of applications for PVP increased from 21,265 in 2019 to 22,512 in 2020 (5.9% increase).

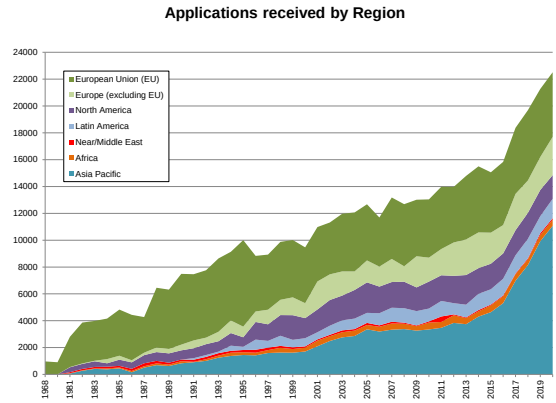
The number of titles issued decreased from 14,688 in 2019 to 13,873 in 2020 (5.5% decrease); a result of a 4.5% decrease in the number of titles issued to residents (9,487 in 2020; 9,935 in 2019) and a 7.7% decrease in the number of titles issued to non-residents (4,386 in 2020; 9,753 in 2019).

The total of 141,034 titles in force in 2020 represented a 1.2% increase on figures for 2019 (139,360).

The following selected graphs indicate trends in applications filed and titles issued since 1986.







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News from SeedSystems.org

Here, we highlight three special journal issues linked to seed systems. The field is both highly dynamic and diverse.

Special Issue #1: Demand-driven seed systems (*Outlook in Agriculture* 50 (4), 2021)

This is a collection of papers that brings together different views on and experiences with seed systems and reflects a breadth of perspectives within CGIAR and beyond. The contributions relate to the major challenges facing seed systems research and development in different contexts and for different crops. One point of agreement among these articles is the need for variety development and seed delivery to be more demand oriented. The editorial of the issue outlines how the various

contributions contained within relate to this agenda. It concludes that we need to be realistic about which farming households can be served by current approaches to seed system development and argues that a wider range of partnerships are required to broaden the reach of seed systems.

See an additional nine publications on demand-driven seed systems here.

Special Issue #2: Agrobiodiversity change in violent conflict and post-conflict landscapes (*Geoforum*, 2021 [still in production])

The analysis of agrobiodiversity has largely neglected conditioning by violent conflict and related processes of social and agrarian change. Similarly, literature on violent conflicts rarely considers interactions with agrobiodiversity, which involves both social and biophysical processes. Considering their frequent spatial overlaps around the world, this paper introduces an investigation around how agrobiodiversity and violent (post)conflicts transform each other and are often interdependent. In doing so, previously disparate lines of research are presented, along with the empirical and theoretical contributions of the papers included in the themed issue. Based on this collective work, further synthesis is called for, whereby research focusing on agrobiodiversity meets and converges with that on violent conflict from various disciplines. The papers that compose this issue evidence how an integrative approach is not only analytically beneficial but also necessary for research supporting the sustainable resolution of conflict, the related conservation of agrobiodiversity, and equitable human-environment relations.

See the full introductory article and an additional seven articles on diverse subject areas.

Special Issue #3: The Role of Policies in Plant Breeding – Rights and Obligations (*Agronomy* 11(11), 2021)

Plant breeding is a powerful applied science that produces innovations throughout the agricultural value chains. Breeding is conducted by scientifically trained breeders, by farmers and amateur breeders, and through collaborations between these. Plant breeding responds to the needs of farmers to cope with pests and diseases and the effects of climate change by focusing on robust varieties. At the same time, it can focus on consumer demands and processor qualities. Through this, breeders in both the formal (public and private) and informal sectors contribute directly or indirectly to a range of public policy priorities. Various policy areas affect plant breeding. Countries differ in their legislation, but seed laws, intellectual property systems, and the implementation of policies around biodiversity and genetic modification, affect the scope for breeders to widen the genetic base of their programmes, select most efficiently, and secure the necessary investments to make the breeding operation sustainable. Several policies intentionally or inadvertently limit breeding. This special issue analyzes the impact of the most relevant (inter)national policies on plant breeding and highlights the above dilemmas.

See an additional 18 articles, all open access, here.

ISAAA Continues to Advocate Public Acceptance of Modern Biotech and Science-Based Communication Through ASCA 2021

Along with its partner organizations, ISAAA held the annual Asian Short Course on Agribiotechnology, Biosafety Regulation, and Communication (ASCA) from 23-26 November 2021. The event, first held in Malaysia in 2018, has consistently served as a platform for representatives from different countries to meet and engage in discussions about recent developments in modern biotechnology, particularly around genetic modification (GM) and gene editing (GEd), as well as related technologies, local and international regulations, effects on the economy, transboundary movement of products, and scientific communication.

ASCA 2021 comprised 48 participants from Brazil, China, the Democratic Republic of Congo, Ghana, India, Malaysia, Philippines, Thailand, and Vietnam. This group was composed of regulators, technology developers, and researchers from both the public and private sectors, and members of the academe as either faculty or students. The event was made possible through the combined efforts of ISAAA, the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Malaysian Biotechnology Information Centre, United States Export Soybean Council, United States Grains Council, Outreach Network for Gene Drive Research, and Murdoch University.

Across six sessions, discussions focused on the different stages of developing a modern biotech product: from research and commercialization, to regulations, to collaborations among stakeholders, and finally to bringing the product to the intended beneficiaries and making them publicly acceptable.

ASCA 2021 also saw the introduction of science diplomacy to the Course. The event concluded by

asking select participants to give their impressions, share what they learned, and provide suggestions for future events. They were also invited to participate in an in-person ASCA 2022 event, COVID-19 permitting.

Source: *Crop Biotech Update, 1 December 2021*

Contributions from Seed Programs

In this section, we invite national seed programs, projects, universities, and regional and international organizations to provide news about their seed-related activities.

EIAR holds Stakeholders Consultative Meeting on Vitalizing Early Generation Seed Production in Ethiopia

The Ethiopian Institute of Agricultural Research (EIAR) convened a stakeholder consultative meeting on "Vitalizing Early Generation Seed Production in Ethiopia: Trends and Way Forward", at its Addis Ababa headquarters from 3-4 August 2021. Participants included public seed enterprises, selected seed producer unions, private seed companies, and federal and regional agricultural research institutes.

The development of improved varieties is not an end by itself, unless they are multiplied and marketed to farmers efficiently and timely, and positively impact farmers' livelihoods. Currently, a total of 1393 varieties are registered, of which 58% were released by EIAR. The private sector, including private seed companies, are also participating in registering varieties and/or hybrids through adaptation testing by commissioning the public research system. A total of 176 varieties and/ hybrids were released by the private sector, which accounted for 13% of the registered varieties. However, only few of the released varieties are reaching farmers.

The availability, access, and use of quality seeds of adapted crop varieties are essential in increasing crop productivity and ensuring food security. The release and registration of superior varieties should be followed by ensuring the supply of good quality early generation seed at the required quantity and time. The existence of strong early generation seed schemes at research centers and with other actors is essential for an effective, efficient, and sustainable national seed system.

Vitalizing early generation seed production schemes in research systems, and across the country, is highly important – as coordinated action is required to ensure a functional seed system. The meeting, therefore, aimed to bring key actors together to discuss the status, challenges, and way forward on early generation seed production and supply in the country.

Participants of consultative stakeholders meeting

Suggestions to revitalize early generation seed production included:

- Finding effective ways to transfer some varieties through an exclusive/inclusive right to seed producers.
- Introducing a business concept into seed units of the research systems.
- Decentralization of breeder seed multiplication.
- Enhancing seed information exchange.
- Improving early generation seed quality at research centers.
- Encouraging targeted breeding to meet growers' demand.
- Issues related to land shortage for early generation seed multiplication.

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SPCRI becomes an Accredited Laboratory

Established in 1998, the Seed and Plant Certification and Registration Institute (SPCRI) is the sole state agency in Iran responsible for certification of seed and vegetative planting material, as well as registration of new plant varieties. The Seed Testing Laboratory (STL–IR01), part of SPCRI, is authorised for the assessment of seed quality according to Articles 10 and 11 of related by-law.

In order to participate in Proficiency Tests and remain informed about all ISTA Rules updates, STL became an ISTA member in 1976. However, becoming an ISTA-accredited laboratory (achieved through further auditing and approval processes) is the only way to support investment in the seed

industry, and accreditation offers a range of benefits to ISTA member laboratories, and to sellers and buyers in the international seed trade and market. In most countries importing/exporting of seed lots is only permitted when the seed lot is accompanied by an ISTA certificate.

As such, SPCRI adopted a strategic plan to obtain an ISTA accreditation certificate, and the following actions were implemented in STL from June 2018:

- The reviewing of ISTA requirements in the ISTA Accreditation Standard for Seed Testing and Seed Sampling.
- Providing standard procedures in compliance with ISTA accreditation requirements to describe all effective processes of management and technical systems in STL.
- Submitting all documents and records to the ISTA Accreditation and Technical Department for assessment by ISTA auditors.

Upon completion of the system and technical audit processes, and when all requirements of the ISTA Accreditation Standard were met, the auditors recommended to the ISTA Executive Committee that accreditation be granted to STL–IR01. Finally, the ISTA Executive Committee agreed to grant international accreditation to STL. Now, STL–IR01 is the only laboratory with international accreditation within Iran and joins a list of 146 other ISTA-accredited laboratories. STL covers a comprehensive range of sampling and seed tests, including purity tests, determination of other seeds, germination, and moisture content tests. The laboratory scope for ISTA accreditation includes the sampling and testing of cereals, pulses, vegetables, spices, herbs and medicinal species, and other agricultural species.

Following SPCRI's participation in the OECD Seed Schemes, obtaining ISTA accreditation has provided Iranian seed producers with optimum opportunity to reach regional and international seed markets. ISTA certificates, issued by STL, have made international seed trade possible, and SPCRI is ready to provide the conditions required to improve Iran's seed industry.

Source: *International Seed Testing Association News Bulletin No. 162, October 2021*

ICARDA Completes Studies on Wheat Seed Systems, Variety Adoption and Impacts in Turkey and Uzbekistan

The three studies – on wheat seed systems, varietal adoption, and impacts in Morocco, Turkey, and Uzbekistan – emerged from a broader perspective of the dynamics in the Central and West Asia and North Africa (CWANA) region's wheat sector. First, being the most important strategic food security crop, wheat is cultivated, at varying levels, in all countries across the CWANA region. It is also widely cultivated in countries beyond this. Second, wheat research has received huge investment at national and international levels and several technologies have been developed and scaled, with varying levels of diffusion achieved across countries. Third, despite a long history of research and wheat seed supply, the public sector continues to dominate the seed delivery landscape, except in a few countries. Fourth, looking to the evolution of the wheat seed sector in developing countries, it is important to appreciate what lessons can be drawn from the development pathways followed by different countries. In particular, the policies and regulatory frameworks put in place, the diversity of public and private seed sector operators allowed to take part, and the capacity of national institutions to discharge their responsibilities.

The study is Morocco was undertaken first, followed by Turkey and Uzbekistan, and these countries were selected based on their contrasting positions in terms of the presence and level of implementation of seed policies and laws, and the diversity of actors in the seed sector – particularly the degree of private sector participation. Uzbekistan was primarily selected to represent several other countries in the CWANA region with relatively low breadth and level of implementation of seed law and private sector participation in the seed sector, while Morocco and Turkey were selected to represent respectively those countries which have medium/medium and high/high levels, respectively, of seed law and seed sector diversity.

The main objectives of these studies are to:

1. Describe the historical developments and status of the wheat sector in respective countries (agricultural and seed policies and institutions, including research and development that affects the wheat sector).
2. Analyze the diversity of wheat in farmers' fields by taking inventory of all wheat varieties being cultivated in the country.
3. Provide credible estimates of adoption of different varieties under cultivation by type of wheat (bread vs. durum), agro-ecology (winter, spring, or facultative), and water source (irrigated or rainfed).
4. Identify factors enhancing or hindering adoption of recent varieties.

5. Provide estimates on the impacts of introducing improved wheat varieties.
6. Shed light on persistent questions regarding the governance and performance of the wheat seed sector.
7. Synthesize lessons learned and their implications for designing and formulating effective interventions.

The first six chapters of each book provide detailed analyses of different topics such as variety development, release and protection as well as seed production and quality assurance and identify major challenges and opportunities in the limits of their individual thematic focus. However, drawing comprehensive conclusions and making policy and institutional recommendations requires a glimpse of the whole system and critical analysis of the trade-offs, synergies, links, and intricacies of the whole wheat sector. Therefore, the final chapter provides a synthesis of the findings of the preceding chapters and is organized as follows:

- Synthesizes the trends, achievements, opportunities, and challenges of the wheat sector.
- Synthesizes the demand-side micro-level analysis, focusing on varietal adoption, impact, and seed demand patterns.
- Synthesizes the wheat sector's overall development, focusing on the supply-side policy and institutional factors affecting farmers' access to seeds of recent varieties with their preferred traits.
- Comprehensively synthesizes combining both the supply and demand-side factors.
- Provides a conclusion and makes recommendations for the way forward.

To present the outcomes of the studies and, more importantly, inform stakeholders, particularly policy makers, two webinars were held – one for Turkey (17 November 2021) and one for Uzbekistan (22 November 2021). The webinar for Turkey was opened by Dr Hasan Gezginc of the Directorate General of Agricultural Research and Polices (TAGEM) of MoA, while that for Uzbekistan was opened by Prof. Norkul Khushmatov, Chief Scientific Secretary at the National Center for Agricultural Knowledge and Innovation from the Ministry of Agriculture in Uzbekistan. With over 200 attendees in total, the webinars provided a platform for insightful discussions and also served to highlight the major steps required by various stakeholders and actors to make the seed sectors in each country more efficient, inclusive, and equitable.

You can access both books through the following links: Turkey and Uzbekistan (will be available soon at the same website).

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Research Notes

This section contains short communications on practical research or relevant information on agriculture or seed science and technology.

Management of Lentil (*Lens culinaris* Medik) Virus Diseases and Vectors in Ethiopia

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Abstract

Viruses became important diseases affecting lentil production in Ethiopia. The study was conducted to find out the efficacy of chemical treatments for management of viral diseases and vectors. Eight treatments with three replications in RCBD design were tested on early- and late-planted lentil fields during the 2019/20 main cropping season. The results revealed non-significant differences in the number of aphid count before first round of Dimethoate spray in late-planted lentil fields, while significant differences were observed in early planted lentil fields. The highest biomass and grain yields were observed in late-planted fields with Celestop seed dressing and one spray of Dimethoate, as well as Proceed plus seed dressing and one-time Dimethoate spray. In early-planted fields, the highest biomass and grain yield were recorded for Celestop seed dressing with one-time Dimethoate spray, and Celestop seed dressing with two-times Dimethoate spray.

Key words: Celestop, Dimethoate, lentil, Proceed plus, seed treatment, virus

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Introduction

In Ethiopia, about 873,225 smallholder farmers cultivated lentil (*Lens culinaris* Med.) on an estimated area of 119,046 ha producing 175,144 tons of grain at average yields of 1.47 t ha^{-1} in 2018 (CSA, 2018). Lentil is also one of the most important legume crops consumed in a variety of forms in the country, particularly during fasting days (Frehiwot, 2009). It is also widely used in crop rotation to improve soil fertility and health through fixation of atmospheric nitrogen.

Farmers encountered major yield losses due to viral and fungal diseases in lentil production. In the 2018/19 cropping season, the outbreak of virus, aphids, and root rot diseases reduced lentil yield by 70% in the North Shoa Zone. Chickpea chlorotic stunt virus (CpCSV, genus *olerovirus*, family *Solemoviridae*), first reported in Ethiopia in 2006, causes an economically important yellowing and stunting disease in legume crops such as chickpea, faba bean, field pea, and lentil in most production areas of North Africa and Central and West Asia (Abraham and Vetten, 2021). Disease epidemics have been reported in Ethiopia, Syria, and Tunisia. The virus is transmitted persistently by aphids of the species *Aphis craccivora* and *Acyrthosiphon pisum* and naturally infects several legume and non-legume hosts. Muhammad et al (2005) reported resistant genotypes against pea seed-borne mosaic virus and suggested that new germplasm should be evaluated under natural field condition.

Crop pests, particularly bacteria, fungi, or viruses (including its vectors), can reduce grain yield and quality and can cause economic losses to farmers. A realistic approach in crop protection should consider controlling pests that affect crop production (Padwick, 1956). To reduce the risk, an integrated disease and vector management can be designed and implemented. The objective of this study was to: (i) evaluate and identify effective disease management options; and (ii) recommend integrated disease (virus) and aphid management options for lentil production.

Materials and methods

Study areas

The experiment was conducted in the main cropping season of 2019/20. Two farmer's fields were selected for early planting: in Kubeti kebele (Field 1) of Siyadebirnawayu and Gerba kebele (Field 2) of Moretnajiru District of the North Shoa Zone in Amhara Regional State. In addition, two farmer's fields were selected for late planting: one at Gende Adi (Field 1) and Garale (Field 2) kebeles in the Aleltu District of North Shoa Zone in Oromia Regional State.

Experimental materials

Two lentil varieties (Alemaya, an improved variety and local landrace), two seed treatment chemicals (Celostop 200ml/100kg seed and Proceed plus 200g/100kg seed with 500 ml water), and one spray chemical (Dimethoate 1000 ml/ha) were used for the experiment (Table 1). In each field, eight treatments with three replications with ICARDA-AR management were conducted (Table 1). A seed rate of 93 and 125 kg ha^{-1} were used for early and late planting, respectively. NPS fertilizer was applied at the rate of 121 kg ha^{-1} during planting. Plot sizes of 9 m^2 (3m x 3m) in RCBD were used.

Table 1. Treatments used for lentil disease management trials

SN	Treatments	Treatment number
1	Control (no seed dressing and no chemical spray)	Treatment 0 (T0)
2	Dimethoate 1lt ha^{-1} spray (three times)	Treatment 1 (T1)
3	Celestop seed dressing (2 ml with 10 ml/1kg seed)	Treatment 2 (T2)
4	Celestop seed dressing + one time spray of Dimethoate)	Treatment 3 (T3)
5	Celestop seed dressing + two times spray of Dimethoate)	Treatment 4 (T4)
6	Proceed seed dressing (200 g for 100 kg seed)	Treatment 5 (T5)
7	Proceed seed dressing + one time spray of Dimethoate)	Treatment 6 (T6)
8	Proceed seed dressing + two times spray of Dimethoate)	Treatment 7 (T7)

Data collection

Data was collected for agronomic performance, such as biomass yield, grain yield, and thousand seed weight (TSW), as well as the number of aphid count before each spray and virus disease severity as a percentage.

Data analysis

To reveal the differences among the treatments in randomized complete block design, data were computed for all the parameters evaluated, as per Gomez and Gomez (1984). The data was also subjected to analysis of variance using SAS software version 8 (SAS, 1999). ANOVA of randomized complete block design was computed using the following mathematical model: Let Yij was the observation for the i^{th} treatment, which was supposed within the j^{th} replication.

Results and discussion

Late planting

The results revealed that there were significant differences between different treatments in lentil disease management trials at two kebeles in Aleltu District. There were no significant differences in number of aphids counts before the first spray (T0)

in fields 1 and 2 (Table 2 and 3). In field 1, the highest number of aphid counts were recorded for T5 (2.13), followed by T0 (1.47) and T3 (1.13) after the second round of Dimethoate spray (Table 2). In field 2, the highest aphid count was recorded for T0 (1.33) and the lowest was recorded for T4 (0.33), with no aphid count for T6 and T7 (Table 3).

There was a significant difference both in terms of biomass yield and grain yield. The highest biomass yield per hectare was recorded for T6 (4.26 tons), followed by T3 (4.01 t) and T4 (3.923 t); whereas, for grain yield, the highest yield per hectare was recorded for T6 (1.75 tons ha^{-1}), followed by T3 and T4 in field 1 (Table 2). However, there was no significant differences were recorded for both biomass and grain yield in field 2 (Table 3).

The highest TSW was recorded for T2 (2.67 g) in the experimental field 1 (Table 2), whereas the highest thousand seed weight was recorded for T3 in experimental field 2 (Table 3).

In terms of virus severity, the results revealed that there were no significant differences between treatments in the experimental fields 1 and 2 (Tables 2 and 3).

Table 2. Performance of chemical treatments at Gende Adi kebele in Aleltu District in 2019/20 cropping season

Treatments	BFS	AFS	BMY	GY	TSW	Virus
T0	0.47	1.47ab	2.57b	0.95b	2.6ab	60
T1	0.67	0.27b	3.44ab	0.96b	2.53ab	51.67
T2	0.47	1.13ab	2.55b	1.01ab	2.67a	43.33
T3	0.4	0.2b	4.01a	1.62ab	2.57ab	46.67
T4	0.93	1.07ab	3.92a	1.59ab	2.57ab	38.33
T5	0.2	2.13a	2.42b	0.87b	2.63a	60
T6	0.07	0.27b	4.26a	1.75a	2.43b	33.33
T7	0.33	0.13b	3.23ab	1.18ab	2.5ab	40
Mean	0.44	0.833	3.3	1.242	2.563	46.67
LSD	-	1.347	1.334	0.78	0.183	-
CV	155.8	92.304	23.092	35.891	4.073	39.65

Note:
*Means followed by the same letter(s) are not significantly different at P<0.05.
BFS = number of aphids count before first spray; AFS = # of aphid count after second spray; BMY = biomass yield in t/ha; GY = grain yield in t/ha; TSW = thousand seed weight in g; Virus = % virus severity.

Table 3. Performance of chemical treatments at Garale kebele in Aleltu District in 2019/20 cropping season

Treatments	BFS	AFS	BMY	GY	TSW	Virus
T0	0.73	1.33a	2.3	0.95	2.47ab	66.67
T1	1.13	0.67ab	2.117	0.9	2.43b	51.67
T2	1.47	0.33ab	2.187	0.87	2.43b	36.67
T3	0.33	0.00b	2.077	0.92	2.63a	53.33
T4	1.27	0.33ab	2.36	0.98	2.50ab	36.67
T5	1.73	0.33ab	2.083	0.84	2.53ab	51.67
T6	1	0.00b	2.23	0.92	2.53ab	53.33
T7	1.53	0.00b	2.457	1.02	2.43b	43.33
Mean	1.15	0.375	2.227	0.926	2.49	49.17
LSD	-	1.2	-	-	0.185	-
CV	89.57	182.86	23.21	22.53	4.22	35.35

Note:
*Means followed by the same letter(s) are not significantly different at P<0.05.
BFS = # of aphids count before first spray; AFS = # of aphid count after second spray; BMY = biomass yield in t ha^{-1}; GY = grain yield in t ha^{-1}; TSW = thousand seed weight in g; Virus = % virus severity.

Pearson correlation analysis of different chemical treatments showed negative and positive association with grain and biomass yield (Table 4). The number of aphid counts before first spray showed a positive but non-significant correlation with grain yield (r = 0.232), and biomass yields (r = 0.159) indicated that, at an early stage, aphid impact had no effect on grain yield. The number of aphid counts after second spray was negatively associated and significantly different in biomass yield (r = -0.481*), while it was negatively correlated and no significant difference (r = -0.324) with grain yield – showing an increase in aphid count number and reduced lentil grain and biomass yield.

Grain yield was positively correlated and highly significant with biomass yield (r = 0.803**). TSW negatively and significantly associated with biomass yield (r = -0.414*). TSW positively associated but non-significant with aphid count before spray (r = 0.07) and aphid count after second spray (r = 0.132).

Virus severity percentage showed negative and highly significant correlation with biomass yield (r = -0.609**) and grain yield (r = -0.773**) at the 0.01 level. Virus severity percentage positively and non-significantly correlated with TSW (r = 0.18) and aphid count after second spray (r = 0.239). Aphid count before spray showed negative and no significant difference with aphid count after second spray (r=-0.048) and virus severity percentage (r = -0.099).

Figure 1. Experimental field 1 at Gene Adi kebele in Aleltu District

Figure 2. Experimental field 2 at Garale kebele in Aleltu District

Table 4. Pearson correlation for late planting in 2019/20 cropping season

	BFS	AFS	BMY	GY	TSW	Virus
BFS						
AFS	-0.048					
BMY	0.159	-0.481*				
GY	0.232	-0.324	0.803**			
TSW	0.07	0.132	-0.414*	-0.203		
Virus	-0.099	0.239	-0.609**	-0.773**	0.18	

Note: * and **correlation are significant at 0.05 level (2-tailed) and at 0.01 level (2-tailed), respectively.

Early planting

The analysis of results indicated significant differences between treatments in the aphid count in experimental fields before spray at Gerba kebe in Moretinajiru (Table 5) and at Ejersa Kubeti kebele

in Siyadebirnawayu (Table 6). No significant differences between treatments were observed after second spray of Dimethoate at Moretinajiru, while significant differences between treatments were observed at Siyadebirnawayu.

No significant differences were observed between treatments in grain yield, TSW, and wilt root rot at Moretinajiru. However, significance differences between treatments were observed in virus severity both at Moretinajiru and Siyadebirnawayu.

Table. 5. Mean value of chemical treatments at Gerba kebele in Moretinajiru District during 2019/20 cropping season.

Treatments	BFS	AFS	GY	BMY	TSW	Virus	WRR
T0	8.73ab	1.47	0.42	1.79a	3.13	33.33ab	1.67
T1	4.33b	2.07	0.44	1.68a	3.4	26.67b	1.67
T2	8.73ab	0.73	0.22	1.15b	2.93	55.00a	1.67
T3	4.47b	0.67	0.36	1.45ab	3	33.33ab	1.67
T4	5.87ab	0.13	0.44	1.71a	3.23	26.67b	2
T5	8.60ab	0.67	0.32	1.55ab	2.93	43.33ab	2
T6	7.33ab	1	0.43	1.70a	3.1	41.67ab	1.67
T7	10.07a	0.13	0.41	1.57ab	3.37	36.67ab	1.33
Mean	7.267	0.858	0.379	1.576	3.14	37.08	1.71
LSD	5.024	-	-	0.517	-	23.64	-
CV	39.47	147.4	34.28	18.74	9.54	36.4	43.31

Note:
BFS = aphid count before spray; AFS = aphid count after second spray; GY = grain yield in ton; BMY = biomass yield in ton; Virus = virus severity in %; WRR = wilt root rot (0-3 scale).

Table 6. Performance of chemical treatments at Ejersa Kubeti kebele in Siyadebirnawayu during 2019/20 cropping season

Treatments	BFS	AFS	Virus
T0	1.67b	0.4ab	53.33ab
T1	2.33ab	0.27ab	33.33ab
T2	2.4ab	0.87a	50.00ab
T3	2.67ab	0.33ab	43.33ab
T4	3.07a	0.07b	36.67ab
T5	2.8ab	0.67ab	60.00a
T6	2.6ab	0.8a	30.00b
T7	2.73ab	0.27ab	43.33ab
Mean	2.533	0.458	43.75
LSD	1.353	0.624	27.52
CV	30.5	77.72	35.92

In early planting, Pearson correlation analysis results revealed highly significant, significant, and non-significant associations between the evaluated characters (Table 7). Grain yield (r = 0.024) and biomass yield (r = 0.188) were positively associated and showed no significant difference with number of aphid count before Dimethoate spray. Whereas, after second Dimethoate spray, they were negatively associated and showed no significance difference with grain yield (r = -0.282) and biomass yield (r = -0.125).

TSW was positively and significantly associated with grain yield (r = 487*) at the 0.05 level. Grain yield positively and highly significantly correlated with biomass yield (r = 0.929**), while with virus severity was negatively and highly associated (r = -0.645**) at the 0.01 level of significance. Biomass yield negatively and highly significantly correlated with virus severity (r = -0.597**) at the 0.01 level of significance.

Table 7. Pearson correlation for early planting in 2019/20 cropping season

	BFS	AFS	GY	TSW	Virus	BMY	WRR
BFS							
AFS	-0.115						
GY	0.024	-0.282					
TSW	0.053	-0.31	0.487*				
Virus	0.182	0.155	-0.645**	-0.31			
BMY	0.188	-0.125	0.929**	0.403	-0.597**		
WRR	0.171	0.062	-0.047	-0.073	-0.046	0.014	

Note: * and ** correlation is significant at 0.05 level (2-tailed) and at 0.01 level (2-tailed), respectively.

Conclusion

We can conclude that an integrated disease and vector management option helps to reduce yield losses from viruses from infected seed transmitted by vectors. Celestop seed dressing with Dimethoate spray, and Proceed plus seed dressing with Dimethoate spray, showed better control.

These results arise from a one-year experiment, and it is highly recommended that it should be repeated in more locations and seasons for further confirmation.

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Meetings and Courses

Announcements of national, regional, or international conferences, meetings, workshops, and training courses appear in this section.

Conferences

With the COVID-19 pandemic continuing to escalate and national and international travel restrictions in place, virtual conferences, workshops, meetings, and trainings have replaced in–person interactions. However, there are signs that face-to-face meetings are making a return.

GPC-Dubai Pulses 22

After a long pandemic pause, the Global Pulse Confederation (GPC) is excited to announce Pulses 2022 – a three day, in-person conference to be held from 10-12 February 2022 in Dubai.

The conference will coincide with the United Nations' World Pulses Day on 10 February and bring together members of the pulses industry from across the globe.

Initially scheduled for 2020, the Pulses 2022 conference follows on from the huge success of the GPC's previous events, the last of which took place in Rio de Janeiro in June 2019. Pulses 2022 also coincides with the leading food and beverage trade exhibition Gulfood 2022, which will be held at the Dubai World Trade Center from 13-17 February 2022.

The pairing of the GPC convention with Gulfood gives members the opportunity to attend two great events during the period, and delegates will also be able to visit Dubai Expo 2020 at the same time.

Registration for the pulse industry's biggest global event opens soon and is available to GPC members only. Not a member? Join the leading information source for the global pulse industry at: https://globalpulses.com/.

The 4th International Legume Society Conference

The *4th International Legume Society Conference* will be held from 18-21 October 2022. The event, which follows earlier conferences in Novi Sad (2013), Tróia (2016), and Poznań (2019), aims to stimulate knowledge exchange and interactions among researchers and stakeholders similarly interested in promoting the greater cultivation and use of grain and forage legumes, as a necessary path towards more sustainable food and feed systems and healthier diets.

The conference will cover a wide range of topics, organized in the following scientific sessions:

- Legume-based value chains: innovation and optimization.
- Legume-based cropping systems: performance, ecosystem services and profitability.
- Legumes for human and animal nutrition and health.
- Legume biodiversity and genetic resource exploitation.
- Genetics and omics-based legume crop improvement.
- Legume breeding: challenges, tools, strategies, and achievements.
- Legume physiology, biochemistry, and systems biology.
- Beneficial legume plant-microbe interactions.
- Understanding and enhancing legume crop tolerance to abiotic stresses.
- Understanding and enhancing legume crop tolerance to biotic stresses.

ISF World Seed Congress 2022

Held from 16-18 May 2022 in Barcelona, Spain, the three-day ISF World Congress will comprise an exhibition, trading floor, meetings, and panel discussions on a host of important topics relevant to the seed sector and beyond. Jointly organized by ISF and the Spanish National Organizing Committee, you can find more information on the event's website.

31st International Horticultural Congress

The International Horticultural Congress will be held from 14-20 August 2022 in Angers, France. The theme of the symposium is "Quality Seeds and Transplants for Horticultural Crops and Restorative Species". It aims to provide new knowledge from academia and industry to identify knowledge gaps that need to be addressed to produce, deliver, and market seeds and transplants for conventional, organic, and field/controlled conditions and to restore environments, in temperate and tropical contexts.

The following topics will be developed during the symposium:

- Tuning plant resilience to climate change
- Transitioning towards organic horticulture
- Environmental and seed conservation
- Seed and transplant innovation systems for horticultural sustainability
- Seeds and transplants are not alone.

For more information on registration, topics, program, and important dates you may visit the conference website.

AFSTA Annual Meeting 2022

The African Seed Trade Association (AFSTA) Congress 2022 will be held in Djerba, Tunisia, between 28 February and 3 March 2022. Please visit the website for more information or contact the AFSTA Secretariat at afsta@afsta.org.

The 33rd ISTA Congress 2022

From 8 May to 11 May 2022, ISTA will hold its 33rd Congress in Sheraton Cairo Hotel & Casino, in Cairo, Egypt.

The dates and venue have been confirmed! In February, a website will be launched where registration will be made, together with all other necessary information provided.

During the Congress, ISTA annual meeting will take place, including elections for ISTA Executive Committee (ECOM). Furthermore, there will be a seminar instead of the initially planned seed symposium.

For more information, please contact: ISTA, Zurichstrasse 50, 8303 Bassersdorf, Switzerland; tel: +41 44 838 6000; fax: +41 44 838 6001; email: ista.office@ista.ch; website: www.seedtest.org.

Courses

ICARDA courses

ICARDA organizes both short- and long-term courses in themes related to its research programs under biodiversity and crop improvement; resilient agricultural livelihood systems; and water, land management, and ecosystems. For more information on ICARDA annual training programs, please contact: Charles Kleinermann, ICARDA, Cairo, Egypt; email: c.kleinermann@cgiar.org.

UPOV distance learning courses

Two sessions of each of the following UPOV distance learning courses are planned in 2022:

1. DL-205, Introduction to the UPOV System of Plant Variety Protection under the UPOV Convention.
2. DL-305, Examination of applications for plant breeders' rights.
3. DL-305A, Administration of plant breeders' rights (Part A of DL-305).
4. DL-305B, DUS Examination (Part B of DL-305).

More detailed information on course contents, timetable, and online registration will be made available on the UPOV website.

The categories for participants are as follows:
Category 1: Government officials or members of the Union endorsed by the relevant representative to the UPOV Council (no fee).

Category 2: Officials of observer states/ intergovernmental organizations endorsed by the relevant representative to the UPOV Council (one non-fee-paying student per state/intergovernmental organization; additional students, CHF1,000 per student).

Category 3: Others (fee, CHF1,000).

More detailed information about the courses and online registration is available on the UPOV website.

UC Davis Seed Biotechnology Center

UC Davis Seed Biotechnology Center offers a number of courses on plant breeding and seed technology, and registration is now open for their Seed Production Course. The course is designed for seed industry professionals to help them expand their knowledge on the underlying biology of seed production; the key roles of bees and other insect pollinators; how to deal with various vegetable and field crops seed production, from agronomic, quality control, and genetic integrity standpoints; and how to meet new challenges through seed production research.

For more information, please visit the website.

Seed Health Online Training

The Seed Health Committee is organizing a Seed Health Online Training on the 18th and 25th February 2022 from 12:30 pm to 03:30 pm (CEST).

It will be based on a combination of lectures (live and recorded presentations due to time differences), videos, quiz and Q&A. For the full programme,

containing details on subjects and presenters, please click here.

Literature

Books, journal articles, and other literature of interest to readers are presented here. This section may contain relevant information on agriculture-related publications including seed policy, regulation, and technology.

Books

FAO. 2021. The State of Food and Agriculture 2021: Making Agri-food Systems More Resilient to Shocks and Stresses

Published by FAO; ISBN-978-92-5-134329-6; ISSN 0081-4539 (print); ISSN 1564-3352 (online); 182pp

The Covid-19 pandemic exposed the vulnerability of agri-food systems to shocks and stresses and led to increased global food insecurity and malnutrition. Action is needed to make agri-food systems more resilient, efficient, sustainable, and inclusive.

The State of Food and Agriculture 2021 presents country-level indicators of the resilience of agri-food systems. The indicators measure the robustness of primary production and food availability, as well as physical and economic access to food. They can thus help assess the capacity of national agri-food systems to absorb shocks and stresses; a key aspect of resilience. The report analyses the vulnerabilities of food supply chains and how rural households cope with risks and shocks. It discusses options to minimize trade-offs that building resilience may have with efficiency and inclusivity. The aim is to offer guidance on policies to enhance food supply chain resilience, support livelihoods in the agri-food system and, in the face of disruption, ensure sustainable access to sufficient, safe, and nutritious food to all.

Websites

Turkish Seed Union

The Türkiye Tohumcular Birliği (Turkish Seed Union, known as TÜRKTOB) was founded and legally registered in 2008, with seven sub-unions – including the Sub-Union of Plant Breeders (BİSAB), Sub-Union of Sapling Producers (FÜAB), Sub-Union of Seedling Growers (FİDEBİRLİK), Sub-Union of Ornamental Plants Producers (SÜSBİR), Sub-Union of Seed Distributors (TODAB), Sub-Union of Seed Industrialists and Producers (TSÜAB), and Sub-Union of Seed Growers (TYAB).

Seed Biotechnology Center

Formally established in 1999, Seed Biotechnology Center (SBC) originally sat within the Dean's office at the College of Agricultural and Environmental Sciences and was associated with the Department of Vegetable Crops. The mission of the SBC is to mobilize the research, educational, and outreach resources of UC Davis, in partnership with the seed and biotechnology industries, to facilitate discovery and commercialization of new seed technologies for agricultural and consumer benefit.

International Legume Society

The International Legume Society (ILS) was founded in 2011 with the aim of maintaining the rich legume research tradition of the former European Association for Grain Legume Research (AEP). It is currently expanded thematically to include forage legumes and incorporate regions across the world.

ILS aims to become the main hub of information and exchange on legume research and exploitation worldwide, linking together the different aspects of agricultural research on the genetic improvement, agronomy, and utilization of grain and forage legumes from the Old World and the Americas. Among others, its major activities include the organization of a triennial international scientific conference and the dissemination of scientific and technical results via the quarterly international journal *Legume Perspectives*.

Newsletters

TAAT News

TAAT News is a quarterly publication from the Technologies for African Agricultural Transformation (TAAT) program, the flagship program of the African Development Bank's (AfDB) Feed Africa Initiative. TAAT's development objective is to rapidly expand access among smallholder farmers, particularly women, to high-yielding agricultural technologies. In turn, this will help improve their food production, assure food security and raise rural incomes, and deliver regional public goods by scaling up agricultural technologies across similar agro-ecological zones.

About ICARDA

The International Center for Agricultural Research in the Dry Areas (ICARDA) is the global agricultural research organization working with countries in the world's dry and marginal areas to deliver sustainable systems solutions that increase productivity, improve rural nutrition, and strengthen national food security. ICARDA's integrated approach includes new crop varieties, agronomy, on-farm water productivity, natural resources management, rangeland and small ruminant production, and socioeconomic and policy research, to better target poverty issues and accelerate technology adoption. As a member of the CGIAR Consortium, ICARDA works closely with national agricultural research programs and other partners in more than 40 countries across North and sub-Saharan Africa, and Central, South, and West Asia.

ICARDA
Science for resilient livelihoods in dry areas

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