LANKA RAINWATER HARVESTING FORUM

NEWSLETTER

VARSHA APRIL/JUNE 2024 VOL 10 ISSUE II





FIRST ROUND OF INTERSCHOOL DEBATE COMPETITION SUCCESSFULLY CONCLUDES



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Lanka Rain Water Harvesting Forum The organized an interschool debate competition aimed at educating students about rainwater harvesting, water conservation, and climate change. The competition also focuses on enhancing the participants' logical thinking and presentation skills, contributing to capacity building. The competition is part of the project "Disaster-Resilient Drinking Water in Flood- and Drought-Prone Areas in Sri Lanka" supported by USAID. The competition took place in the Anuradhapura, Badulla, Mannar, and Mullaithivu districts, inviting schools benefiting from rainwater harvesting systems to participate.

The first round of the debate competition was successfully conducted in all four districts during the period April to June 2024, with 12 schools from each district participating. The participants debated on the social, economic, and environmental benefits of rainwater harvesting.

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Badulla District

The first round in Badulla District was held on April 25, 2024, at the Uva Province Library Service Auditorium. The selected schools for the second round are:

- B/ Kandegedara M.M.V.
- B/ Kandakepuulpatha M.V.
- B/ Malpotha Sri Mahindodaya M.V.
- B/ Godunna M.V.
- B/ Galahagama Dharmaraja M.V.
- B/ Kiuwulegedara Mohottala M.V.

The debate was evaluated by an experienced panel of judges for the Badulla District which included:

- Associate Professor Mrs. Senani Wijewardhana, Faculty of Technological studies, Uva Wellassa University

- Mr. R. M. P. Nishantha, Deputy Director of Education, Uva Province

- Mr. W. A. C. P. Wijebandara , National Water Supply and Drainage Board, Badulla

Mullaithivu District

The first round in Mullaithivu District was held on June 12, 2024, at the Zonal Education Office premises in Thunukkai. The selected schools for the second round are:

- Mu/ Olumadhu Tamil Vidyalayam
- Mu/ Thunukkai GTMS
- Mu/ Naddankandal GTMS
- Mu/ Theravil GTMS
- Mu/ Thenniyankulam GTMS
- Mu/ Koolamurippu GTMS

The panel of judges for the Mullaithivu District included:

- Mrs. S. Jeyarajah, In-Service Advisor, Zonal Education Office Mullaithivu

- Mr. Andrew Piraveen, National Water Supply and Drainage Board, Mullaithivu

- Mr. T. Pratheepan, In-Service Advisor, Zonal Education Office Thunukkai

Mannar District

The first round in Mannar District was held on June 13, 2024, at the Teachers Training Centre Mannar. The selected schools for the second round are:

- Mn/ Kaddaiadamban RCTMS
- Mn/ De La Salle College
- Mn/ Arippu RCTMS
- Mn/ Chilawathurai GMMS
- Mn/ Parikarikandal GTMS
- Mn/ Thalaimannar Pier GTMS
- The panel of judges for the Mannar District included:

- Mr. S. Ramesh, Service Advisor, Zonal Education Office Mannar

- Mr. A. G. M. Nabrees, Officer in Charge, National Water Supply and Drainage Board, Mannar

- Miss K. Kanagathurkka, Teacher, Siththi Vinayagar Hindu College, Mannar

Anuradhapura District

The first round in Anuradhapura District was held on June 20, 2024, at the Department of Cooperative Development Auditorium. The selected schools for the second round are:

- Anu/ Parasangaswewa Vidyalaya

- Anu/ Horuwila Vidyalaya
- Anu/ Thalawa Central College
- Anu/ Buddangala Central College
- Anu/ Walisinghe Harischandra Vidyalaya
- Anu/ Sri Seelawansha Maha Vidyalaya

The panel of judges for the Anuradhapura District included:

- Eng. Sudath Rathnayake, Assistant General Manager, National Water Supply and Drainage Board, Anuradhapura

- Prof. N. S. Abeysinghe, Head of the Department of Agricultural Engineering and Soil Sciences, University of Rajarata, Sri Lanka

- Mrs. Suranjee Ammuduwage, Zonal Director of Education, Thambuttegama

The Lanka Rain Water Harvesting Forum extends heartfelt gratitude to the esteemed judges as well as the authorities at Uva Wellassa University, Rajarata University, Provincial and Zonal Education Departments and National Water Supply & Drainage Board of the Province/districts for the support given for making these event successful. We express our appreciation to the participating schools for their efforts in the first round of the competition and congratulate the winners. We look forward to the next rounds as we continue to promote the importance of water conservation and sustainability among young students

"Every drop of rain saved is a step closer to a sustainable future."

ATMOSPHERIC WATER HARVESTER PROVIDES WATER TO ARID COMMUNITIES USING HYGROSCOPIC GEL AND SALTS.

Authors: Chengjie Xiang, Xinge Yang, Fangfang Deng, Zhihui Chen, and Ruzhu Wang From :https://publishing.aip.org/publications/latest-content/harvesting-water-from-air-with-solar-power/

More than 2.2 billion people currently live in waterstressed countries, and the United Nations estimates that 3.5 million die every year from water-related diseases. Because the areas most in need of improved drinking water are also located in some of the sunniest places in the world, there is strong interest in harnessing sunlight to help obtain clean water.

Researchers from Shanghai Jiao Tong University in China developed a promising new solar-powered atmospheric water harvesting technology that could help provide enough drinking water for people to survive in those difficult, dryland areas. They published their work in Applied Physics Reviews, an AIP Publishing journal.

"This atmospheric water harvesting technology can be used to increase the daily water supply needs, such as household drinking water, industrial water, and water for personal hygiene," said author Ruzhu Wang

Historically, researchers have faced challenges when injecting salt into hydrogels as the higher salt content reduced the swelling capacity of the hydrogel due to the salting-out effect. This led to salt leakage and the water absorption capacity decreased.



Schematic diagram of the daytime atmospheric water harvesting cycle. Credit: Wang Ruzhu

"We were impressed that even when up to 5 grams of salt was injected into 1 gram of polymer, the resulting gel maintained good swelling and salttrapping properties," said Wang.

The researchers synthesized a super hygroscopic gel using plant derivatives and hygroscopic salts that was capable of absorbing and retaining an unparalleled amount of water. One kilogram of dry gel could adsorb 1.18 kilograms of water in arid atmospheric environments and up to 6.4 kilograms in humid atmospheric environments. This hygroscopic gel was simple and inexpensive to prepare and would consequently be suitable for large-scale preparation.

In addition, the team adopted a prototype with desorption and condensation chambers, configured in parallel. They employed a turbofan in the condensation chamber to increase the recovery of desorbed water to more than 90%.

In an outdoor prototype demonstration, the team found it released adsorbed water even in the morning or afternoon when the sun is weak. The system could also achieve simultaneous adsorption and desorption during the daytime.

The team will work to achieve simultaneous adsorption and desorption using renewable energy to maximize daily water yield per unit mass of adsorbent to further optimize the system's performance for practical applications in water generation.

In addition to daily water production, sorbent materials that harvest atmosphere water could also play an important role in future applications such as dehumidification, agriculture irrigation, and thermal management for electronic devices.

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BOOST YOUR AGRICULTURAL PRODUCTIVITY BY INSTALLING GROUNDWATER RECHARGE SYSTEMS.

Lack of water is a serious issue that has a significant influence on agriculture. It can result in less productive farming, decreased cultivation, and lower farmer income. Farmers' incomes fall when there is less produce to sell, creating a vicious cycle of poverty that prevents investment in better farming practices and infrastructure.

Here, we will look at a farmer's narrative, both his struggles and his success in conquering the situation.

Mr. Selvarasa, a dedicated farmer from Vidiyapuram in Oddusuddan, Mullaitivu, resides with his wife, two sons, a daughter, and a granddaughter. His sons helps him in the fields, while his daughter studies and his granddaughter attends nursery school. Despite their hard work, Mr. Selvarasa's farming attempts have been greatly impeded by water scarcity, which causes a slew of issues.

Their primary source of income is farming, but the underlying issue for them is a shortage of available water, especially during the dry season. No matter how much effort did they put into their agricultural activities, they ended up with low agricultural products, causing financial troubles.. Mullaitivu district lies in the dry zone, hence natural water availability is limited. Mr. Selvaras and his family lived in refugee camps throughout the civil war and then returned to Oddusudan, where they had lived before. He recounted his experience with us: "The Civil War had a significant impact on our life; we were forced to abandon our homes, agricultural areas and daily lives to escape the violence. After it was over, we returned to our villages and resumed our lives."

Mr. Selvarasa cultivated onions, papaya, and vegetables, but the inadequate water supply resulted in a low yield. Despite having a large land area, he was unable to expand his agricultural activities due to a lack of water. Mr. Selvarasa stated, "We have an agro well, but it does not have enough water; during the dry season, it runs dry." As a result, I have to curtail my agricultural activities."

Mullaitivu is one of the project districts where the Lanka Rain Water Harvesting Forum is operating. LRWHF identified the problem and installed a groundwater recharge system in Mr. Selvarasa's agricultural well, hoping to enhance well quality and quantity. The LRWHF installed the system in the first quarter of the seventh year (2022) of the USAID-supported project, and they began to benefit from it about a year later.



Well Recharge System at S. Selvarasa's home

Selvarasa shared his experiences with us. "Before establishing a groundwater recharge system, I farmed ¼ acre of land. However, after one year, we saw a substantial rise in the water level in the well. I started cultivating 1 ¼ acre of land." This helped him increase his productivity and revenue



Papaya cultivation

He cultivated half an acre with onions and profited Rs.50,000 . Another 1/4 acre was used to cultivate papaya (papaw), resulting in an additional Rs 5,000 of earnings. The remaining area was used to grow vegetables for household consumption, assuring a consistent supply of fresh produce for his family's requirements. This, on the one hand, increases revenue and the other hand reduces household expenditure.

Overall, the groundwater recharge system brought multiple benefits to Mr. Selvarasa and his family through improving water availability, as discussed, it enhanced food productivity while enabling high-income generation, and home gardening provided food security to his family. Additionally they are using water saving measures such as the dripped irrigation method for watering their cultivations., This is a brilliant example of sustainable water management practices enabling long-term agricultural productivity. Further, this enhances the groundwater level, providing resilience to the climate change impacts.

In conclusion, the installation of the groundwater recharge system by the Lanka Rain Water Harvesting Forum has transformed Mr. Selvarasa's agricultural prospects. This sustainable solution not only addressed the immediate water scarcity issues but also enabled significant improvements in productivity, income, and food security. By embracing such innovative measures, Mr. Selvarasa's family is now on a path toward a more resilient and prosperous future, demonstrating the profound impact of sustainable water management on rural livelihoods.



Agricultural Land – Watering from Dripped Irrigation Systems

நிலத்தடி நீர் செறிவூட்டல் அமைப்புகளை நிறுவுவதன் மூலம் விவசாய உற்பத்தித் திறனை அதிகரித்தல்.

தண்ணீர் பற்றாக்குறை விவசாயத்தில் மிகுந்த தாக்கத்தை ஏற்படுத்தும் தீவிர பிரச்சினையாகும். இது விவசாயத்தின் குறைதல், சாகுபடிக்கான குறைவு, மற்றும் விவசாயிகளின் வருமானம் குறைதலை உருவாக்குகிறது. இதனால், அவர்கள் நிதி சிக்கல்களை சந்திக்க நேரிடுகிறது. இந்த நிலையை வெற்றியுடன் எதிர்கொண்ட ஒரு விவசாயியின் கதையை இங்கே பார்க்கலாம்.

முல்லைத்தீவு, ஒட்டுசுட்டான் விதியாபுரத்தைச் சேர்ந்த விவசாயி செல்வராசா, தனது மனைவி, இரண்டு மகன்கள், ஒரு மகள் மற்றும் ஒரு பேத்தியுடன் வசிக்கிறார். அவர்களின் முதன்மை வருமான ஆதாரம் விவசாயமே. எனினும், வறண்ட காலங்களில் தண்ணீர் பற்றாக்குறை காரணமாக, விளைச்சல் குறைவதால் நிதி சிக்கல்களை சந்திக்க நேரிடுகிறது. முல்லைத்தீவு மாவட்டம் உலர் வலயத்தில் அமைந்துள்ளதால், இயற்கையான நீர் தேவை தட்டுப்பாட்டில் உள்ளது.

திரு. செல்வராசா மற்றும் அவரது குடும்பம் உள்நாட்டுப் போர் முடிந்ததும், அவர்கள் மீண்டும் தங்கள் கிராமத்திற்கு திரும்பி, வாழ்க்கையை மீண்டும் தொடங்கினர். செல்வராசா வெங்காயம், பப்பாளி மற்றும் காய்கறிகளை பயிர்ச்செய்கை செய்து வந்தார். எனினும், தண்ணீர் பற்றாக்குறை காரணமாக குறைந்த விளைச்சலே கிடைத்தது. இவரது விவசாய கிணற்றில் போதுமான தண்ணீர் இல்லாததால், விவசாய பணிகளை விரிவுபடுத்த முடியவில்லை.

இலங்கை மழை நீர் சேகரிப்பு மன்றம் இயங்கி வரும் திட்ட மாவட்டங்களில் முல்லைத்தீவும் ஒன்று. LRWHF செல்வராசாவின் இப்பிரச்சினையைக் கண்டறிந்து, கிணற்றின் தரத்தையும் அளவையும் மேம்படுத்தும் வகையில், அவரது விவசாயக் கிணற்றில் நிலத்தடி நீர் மீள்நிரப்பும் அமைப்பை நிறுவியது. LRWHF ஆனது ஏழாவது ஆண்டின் (2022) முதல் காலாண்டில் இந்த அமைப்பை நிறுவியது, மேலும் ஒரு வருடம் கழித்து செல்வராசாவின் குடும்பம் அதிலிருந்து பயனடையத் தொடங்கினர்.

அவர் இந்த நிலத்தடி நீர் மீள்நிரப்பு அமைப்பினால் பெற்ற நன்மைகள் குறித்து தனது அனுபவங்களை நம்மிடம் பகிர்ந்து கொண்டார். "நிலத்தடி நீர் ரீசார்ஜ் அமைப்பை நிறுவுவதற்கு முன்பு, நான் ¼ ஏக்கர் நிலத்தில் விவசாயம் செய்தேன். இந்த அமைப்பை நிறுவி ஒரு வருடத்திற்குப் பிறகு, நீர் கணிசமான உயர்வைக் கண்டோம். இதனால் நான் 1 ¼ ஏக்கர் நிலத்தில் பயிரிடத் தொடங்கினேன்." நிலத்தடி நீர் மீள்நிரப்பு அமைப்பு தனது உற்பத்தித்திறனையும் வருவாயையும் அதிகரிக்க உதவியது தொடர்பில் இவ்வாறு கூறினார்.

இதன் மூலம் அவர் அரை ஏக்கர் வெங்காயம் விவசாயம் செய்து 50,000 ரூபாய் லாபம் பெற்றார் . மேலும் 1/4 ஏக்கர் காணி பப்பாளி பயிரிட பயன்படுத்தப்பட்டது, இதன் விளைவாக கூடுதலாக 5,000 ரூபாய் வருவாய் கிடைத்தது. மீதமுள்ள பகுதி வீட்டு உபயோகத்திற்காக காய்கறிகளை பயிரிட பயன்படுத்தப்பட்டது, அவரது குடும்பத்தின் தேவைகளுக்கு புதிய விளைபொருட்களின் நிலையான விநியோகத்தை உறுதி செய்தது. இது ஒருபுறம், வருமானத்தை அதிகரிக்கிறது மற்றும் வீட்டு செலவுகளை குறைக்கிறது.

தற்போது அவர்கள் சொட்டு நீர் பாசன முறையை பயன்படுத்தி விவசாயம் செய்து வருகின்றனர். இது தவிர, நீண்டகால விவசாய உற்பத்தியை செயல்படுத்தும் நிலையான நீர் மேலாண்மை நடைமுறைகளுக்கு இது ஒரு சிறந்த எடுத்துக்காட்டு. மேலும், இது நிலத்தடி நீர்மட்டத்தை மேம்படுத்தி, பருவநிலை மாற்றத்தின் தாக்கங்களை எதிர்க்கும் தன்மையை வழங்குகிறது.

இலங்கை மழைநீர் சேகரிப்பு மன்றத்தினால் நிலத்தடி நீர் மீள்நிரப்பு அமைப்பு நிறுவப்பட்டமை திரு.செல்வராசாவின் விவசாய வாய்ப்புகளை மாற்றியமைத்துள்ளது. இந்த நிலையான தீர்வு உடனடி நீர் பற்றாக்குறை பிரச்சினைகளை நிவர்த்தி செய்ததோடு மட்டுமல்லாமல் உற்பத்தி, வருமானம் மற்றும் உணவுப் பாதுகாப்பில் குறிப்பிடத்தக்க முன்னேற்றங்களைச் செயல்படுத்தியது. இத்தகைய புதுமையான நடவடிக்கைகளை மேற்கொள்வதன் மூலம், திரு. செல்வராசாவின் குடும்பம் இப்போது மிகவும் நெகிழ்ச்சியான மற்றும் வளமான எதிர்காலத்தை நோக்கி ஒரு பாதையில் செல்கிறது, இது கிராமப்புற வாழ்வாதாரங்களில் நிலையான நீர் மேலாண்மையின் ஆழமான தாக்கத்தை நிரூபிக்கிறது. වැසි ජලය රැස්කිරීම මගින් ඵලදායී පාසල් ගෙවත්තක්

ශී ලංකාව ජලයෙන් පොහොසත් රටක් වුවද, වර්ෂාපතනයේ සහ දේශගුණික තත්ත්වයන්ගේ වෙනස්කම් හේතුවෙන් සමහර පුදේශ ඔවුන්ගේ ජල අවශෘතා සපුරාලීමට අරගල කරයි. වව්නියා දිස්තික්කයේ, පූවරසන්කුලම් ගුාම නිලධාරී වසමේ පිහිටි පූවරසන්කුලම් මහා විදහාලයටද පුමාණවත් ජල සැපයුමක් නොමැති වීම හේතුවෙන් තීරණාත්මක අභියෝගයකට රැසකට මුහුණ පෑමට සිදුවිය. පානීය ජල පහසුකම්, සනීපාරක්ෂාව, පිරිසිදු කිරීම, ගෙවතු වගාව වැනි අතෘවශෘ කියාකාරකම්වලට ජල හිඟය බෙහෙවින් බලපෑම් කළේය.

2014 සහ 2015 අතර, ලංකා වැසි ජලය රැස්කිරීමේ සංසදය මෙම ගැටලුවට විසදුමක් ලෙස ලීටර් 30,000 ක ධාරිතාවකින් යුත් වැසි ජලය රැස්කිරීමේ පද්ධතියක් ඉදිකර දෙන ලදී. ලංකා වැසි ජලය රැස්කිරීමේ සංසදයහි ක්ෂේතු සම්බන්ධීකාරක රුදු විජේන්දුන් මහතා පසුගියදා පාසලට ගොස් වහපෘතියේ සාර්ථකත්වය පිළිබඳ අවබෝධයක් ලබා ගත්තේය.

අද වන විට පූවරසන්කුලම් මහා විදහලය එහි ජල කළමනාකරණ පිළිවෙත් සාර්ථක ලෙස වැඩිදියුණු කර ඇත. මනාව පවත්වාගෙන යන ගෙවතු වගාවන් සඳහා මෙන්ම, පාසලේ හරිත අවකාශයන් නඩත්තු කිරීම සහ පාරිසරික අධහපන කටයුතු සඳහා රැස්කරන වැසිජලය භාවිතා කරයි.

මීට වසරකට පෙර වැසි ජලය රැස් කිරීමේ වැදගත්කම තවදුරටත් තහවුරු කිරීම සඳහා රුදා මහතා විසින් පාසලේදී දැනුවත් කිරීමේ වැඩසටහනක් පවත්වන ලදී. මෙම මුලපිරීම පද්ධතියේ පුතිලාභ පිළිබඳව සිසුන් සහ කාර්ය මණ්ඩලය අතර උනන්දුව නැවත ඇති කිරීමට හේතුවිය විශේෂයෙන් ම වැසි කාලවලදී ඵලදායි ලෙස වැසි ජලය රැස් කිරීම නියඟ කාලවලදී ජල සුරක්ෂිතතාව සඳහා සැලකිය යුතු ලෙස දායක විය හැකි ආකාරය මෙම වැඩසටහන මගින් පෙන්වා දෙන ලදී.

දැනුවත් කිරීමේ වැඩසටහනෙන් පසුව, පාසල විසින් වඩාත් උනන්දුවෙන් වැසිජල රැස්කිරීමේ පද්ධතිය නඩත්තු කිහිපයක් සිදු කර ඇති අතර විවිධ පාසල් කිුයාකාරකම් සඳහා විශ්වාසනීය ජල සැපයුමක් සහතික කරමින් පද්ධතිය වඩාත් ඵලදායී ලෙස භාවිතා කිරීමට මෙම උත්සාහයන් හේතු වී ඇත.

"මීට වසර තුනකට පෙර මම මෙම පාසලේ විදුහල්පතිවරයා ලෙස පත්වුණා. එදා ඉඳන් මම කල්පනා කළේ මේ වතුර ලීටර් 30,000 ඵලදායී ලෙස පාවිච්චි කරන්නේ කොහොමද කියලා. දැනුවත් කිරීමේ වැඩසටහන හරහා වැසි ජලය රැස් කිරීම පිළිබඳව වඩාත් දැනුවත් වීමෙන් පසුව මම සිසුන්ගේ සහාය ඇතිව වැසි ජලය භාවිතා කරමින් වගා කිරීම ආරම්භ කළෙමි. ඔවුන් පාසැලේ භාවිතය සඳහා ඖෂධ පැළෑටි, ජම්බු සහ කෙසෙල් වගා කළා. මීට අමතරව, ඔවුන් පිරිසිදු කිරීම් සඳහාද වැසි ජලය භාවිතා කරනවා.දරුවන් සහ ගුරුවරුන් 442 කට මෙම වැසිජලය රැස්කිරීමේ පද්ධතිය මගින් ආරක්ෂිත ජල සැපයුමක් සලසා ඇත.පවතින ජල සම්පත් කාර්යක්ෂමව භාවිතා කිරීම සඳහා මෙය කදිම උදාහරණයක් බව ඔහු විශ්වාස කරයි. විදුලි වියදම අධික වීම නිසා ළිං ජලය පොම්ප කිරීම සුදුසු විකල්පයක් නොවේ. එහි පුතිඵලයක් ලෙස වැසි ජලය රැස් කිරීම කෘෂිකාර්මික කටයුතු සඳහා පුශස්ත විසඳුම වන්නේ එය පිරිවැයෙන් තොර තුමයක් වන බැවිනි. "මුරලිදරන් මහතා අදහස් දක්වමින් පුකාශ කළේය.



වැසි ජලය භාවිතා කරමින් ඖෂධ පැළෑටි සිටුවීම



රාජ අල වගාවේ අස්වැන්න

උතුරු පළාතේ, භූගත ජලයේ අධික ලවණතාව සැලකිය යුතු කරුණක් වන අතර වැසි ජලය රැස් කිරීම හරහා භූගත ජලය මත යැපීම අවම කිරීම මගින්, මෙම ගැටලුව අවම කරගැනීමට පාසලට හැකිවී ඇත. වැසි ජලය රැස්කිරීම සිසුන්ට සහ කාර්ය මණ්ඩලයට හිතකර ඉගෙනුම් පරිසරයක් සඳහා අවශෘ සම්පත් වෙත පුවේශය ඇති බව සහතික කරයි. ලංකා වැසිජලය රැස්කරන්නන්ගේ සංසදය හා පාසල් පුජාවගේ සහයෝගී පුයත්නයන් තුළින් පාසල තුල වඩාත් සුරක්ෂිත සහ තිරසාර ජල අනාගතයකට මග පෑදී ඇත.

VARSHA APRIL/JUNE 2024 VOL 10 ISSUE II

CHILDREN'S CORNER

OUR ENVIRONMENT!

F н х S R 0 υ N Е ĸ Y J F 0 L D Μ А Y Е F Е Е 0 Z A v х I D W Α K Ν х Е N N G Y S Ρ M G L 0 в А L W Α R Μ L F I D М Т F I R Е С Y С L Е G н L L Е С Ε С L М Α т н А N G Е υ D S F L S т Е D Е F 0 R Е A Т T 0 N Ν L U L Ρ Е G Е R Ε D S Е С S E Ν D Α Ν 1 0 Ρ F Ρ Е Ε F Е D D N D Х Е 0 А Ν W R Е N Ε А В L Е R U А C Q R R R D 0 Y S R Е F Q R Ν Е U S M Ν А I L Е Е U Z Е Е υ Ζ Т E A F С Е R υ υ F w S Е C F х C F 1 ٧ G U 0 Ε R U V L Y P 0 т 0 Ζ Е Т S Y F L L υ L N н N J С υ C А Q 0 L х I Т 0 L J Ρ L Q Е 0 G Е Z М 0 υ E R Т н D А М А Y L А н Т Ρ 0 Х В Х N 0 U N F Е 0 F А ĸ Α M

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Damage Endangered Species Deforestation Climate Change

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