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**Assessing the threat posed to forest and
horticultural plants by invasive insect
species in Northern Areas of Pakistan**

A field survey of mealy bug outbreak in Baltistan

December, 2008

KNOWLEDGE FOR LIFE



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1. Executive Summary

CABI SA undertook a field survey on the request of Ministry of Food Agriculture and Livestock to assess the status of an invasive pest species (mealy bug) which had caused wide spread damage to forest and fruit trees in Skardu District. A team of scientists field survey from September 15-27, 2008 and held meetings with the concerned stakeholders.

On way to Skardu, willow, poplar and apricot trees were seen severely infested by a species of mealy bug in Baghacha approximately 60-70 KMs before Skardu city. Willow trees infested by the pest were also observed in Brum approximately 55-60 KMs before the Skardu city.

In Skardu city, Koro, Gamba Grong, Krashmathang, Khumbo Shagaran, Patowal, Api Soq, Khar Gron, Chumik, Gangpoi, Sukamandan, Eid Gah Area, Hassan Colony, Satellite Town, City Park, Ali Abad, Haji Gaam Area and Sher Thang (all different mohallahs and wards of Skardu city) plantation (both forest and horticultural plants) was severely infested by the pest.

At all the localities willow was very severely infested followed by poplar, apricot, apple, mulberry and almond. As it was late in the season therefore abundant egg masses of the pest was recorded at every survey spot.

At some places people used gunny bag bands on the tree trunks to manage the pest population but with such a vast host range this option seems practically ineffective. For the last couple of years pesticides have been used as an option to manage the pest but the results were not promising. On the contrary flair up in the pest population is reported wherever pesticides have been sprayed.

The pest species recorded is different from the mealy bugs attacking cotton, citrus mango and sugarcane. For authentic identifications, samples of both mealy bug and its predator were sent to Natural History Museum UK. Mealy bug has been identified as *Drosicha* sp. det. Martin & Gullan (Monophlebidae: Coccoidea: Hemiptera) and its predator as *Sumnius vestitus* (Mulsant) det. Booth (Coccinellidae: Coleoptera).



2. Objectives

- a. Field visit to ascertain the status of invasive species (mealy bug) in Skardu and Gilgit
- b. Meeting with the key people and Organizations of the area regarding invasive species in Northern Areas
- c. Collection of invasive specie for identification purposes
- d. Collection of any associated natural enemies to invasive species from the field

3. Detailed Report

3.1 Background

This visit was undertaken after a fax sent to the Federal Minister of Food and Agriculture, Government of Pakistan by Raja Jalal Hussain Maqpon, Chairman District Council Skardu. In his fax he requested the Ministry of Food, Agriculture and Livestock to support Agriculture Department Skardu to address outbreak of mealy bug in Baltistan. MinFAL requested CABI SA to assist in conducting a survey of the affected areas to ascertain the status of the pest and its identification as well as identification of any associated natural enemies.

A team of scientists therefore visited the area from Sep 15-27, 2008 with the aforementioned objectives.

3.2 Geography of the area

Skardu is the principal town of Baltistan and the capital of Skardu District, one of the districts making up Pakistan's Northern Areas. Skardu is located in the 10 km wide by 40km long Skardu Valley, the confluence of the Indus river and the Shigar River. Skardu is situated at an altitude of nearly 2,500 m (8,200 feet), the town is surrounded by grey-brown coloured mountains, which hide the 8,000 metre peaks of the nearby Karakoram range.



at

The climate of Skardu during the summer is moderated by its mountain setting and the intense heat of lowland Pakistan does not reach here. The mountains also block



out the summer monsoon and summer rainfall is thus quite low. However, these mountains result in very severe winter weather. During the April to October tourist season, temperatures vary between a maximum of 27°C and a minimum (in October) 8°C. However, temperatures can drop to below -10°C in the December-to-January midwinter period.

3.3 Land Cover (Forest and Horticultural Plants)

Following is the list of forest and horticultural plants in Skardu and Gilgit.

Forest Plants:

Populus nigra, *Populus ciliate*, *Populus* spp., *Salix wilhelmsiana*, *Salix babylonica*, *Salix* spp. (High alpine *salix*), *Elaeagnus ambulata* (Russian olive), *Morus alba*, *Eleanthus* sp., *Robnia pseudocacia*, *Platanus orientalis*, *Pinus wallichiana*, *Picea smithiana*, *Fraxinus xanthoxyloides*, *Celtis australis*, *Rosa* sp., *Betula utilis* (Timber line tree)

Horticultural Plants:

Malus pumila, *Prunus armeniaca*, *Prunus domestica*, *Vitis vinifera*, *Amygdalus communis*, *Juglans regia*, *Pyrus communis*, *Prunus persica*, *Punica granatum*.

Willow Distribution in Pakistan

Willow (*Salix wilhelmsiana*) is probably the commonest woody plant in northern region. Willow usually grows beside streams or where water is not far away. These woody species are very important in the economy of the villages in the dry inner valleys. Willow and poplars are cultivated in every village for fuel and building purpose.

Although a number of species are found in Pakistan. Willow (*Salix wilhelmsiana*) species has been mostly reported from northern parts of the country. It usually occurs in Gilgit, Hunza, Niltar valley, Baltistan, Skardo, Satpur stream, Shagar valley, Nubra and Shayok valleys and also in some parts of Kashmir.

3.4 Host Range of Mealy Bug

The data on mealy bug infestation on different plants have been recorded on the basis of apparent damage. Apparent damage is the direct damage caused by mealy bug to different plant parts. The mealy recorded during this survey occurs above ground and directly sucks plant sap resulting into stunted plant growth. During this survey, different host plants were recorded and severity level of the mealy bug on different plants was recorded by its direct damage done, presence of mealy bug exuvae, and wax-coated egg masses in different plant parts.

During the field surveys following severity levels of mealy bug were observed on different plants

Plants	Level of infestation
Willow	Very severe/Primary host
Poplar	Very sever to severe
Apricot	Severe
Apple	Moderate
Mulberry	Low

Very Severe= Plant trunk and branches completely covered with egg masses and mealy bug

Severe = Partially covered tree trunk with egg masses

Moderate = Few egg masses on tree trunk

Low = very small Egg masses only on tree branches



3.5 Field Survey

Gilgit

Survey was conducted in the Gilgit city and surrounding areas. In the city area a few infested willow plants were observed. No adult was recorded as the pest was in over-wintering as eggs. Egg masses were recorded in the cracks and crevices of the trees. In the surrounding areas especially near the Gilgit river banks (both left bank and right bank) poplar trees were observed infested by the pest. Egg masses were observed in the crack, crevices as well as around the trunk on the soil. Predators were also recorded feeding on the eggs and were collected for the identification purposes.



Skardu

On the way to Skardu trees infested by the pests were observed in Baghicha, approximately 60-70 KMs before Skardu city. Poplar, apricot and willow trees were observed severely infested by the pest. Pest was over-wintering as egg stage. Egg masses were observed in the cracks and crevices on the trunk, joints of branches as well as around the trunk base on the soil. Whole of the tree trunks as well as soil was covered by the honey dews excreted by the pest. Dead insects were recorded on the tree trunks. Exuviae of the pest were also observed sticking to the tree trunks. Trees near to the water channels were much more severely infested than the trees away from them. No natural enemies were recorded or observed from this site. Egg masses from different portions of the tree were collection for the emergence of any natural enemy associated with the egg stage of the pest.



Willow trees infested by the pest were recorded in Brum, which is 55-60 KMs from Skardu city. In Brum mostly willow trees were infested while very little infestation was observed on other plantation. In this place also egg masses were observed in the cracks and crevices as well on the soil around the tree trunks. Collection of eggs from different parts of the trees was made for the possibility of any natural enemy associated with the egg stage.



A thorough survey was conducted in the Skardu city and surrounding areas in order to observe and record the severity of the



problem as well as collection of live specimens of pests and any associated natural enemies for identification purposes. Most of the areas within the Skardu city were observed severely infested by the pest.

Willow seems to be the most preferred host followed by poplar, apricot, apple and mulberry in Skardu. All the plantations on the river bank or on the water channels were severely infested by the pests. Within



Skardu city plantations in Koro, Gamba Grong, Krasmathang, Khumbo Shagaran, Patowal, Api Soq, Khar Gron, Chumik, Gangopi, Sukamandan, Eid Gah Area, Hassan Colony, Satellite Town, City Park, Ali Abad, Haji Gaam Area and Sher Thang (all different mohallahs/wards of Skardu city) were severely infested by the pest. Tree trunks and soil around the tree trunks was covered by the honey dews excreted by the pest during the active season. Tree trunks, branch joints and soil around the trunks were covered by the white woollen material produced by the pest covering the egg masses was observed. Egg masses were collected for the emergence of any natural enemy associated with the egg stage. No predators were recorded in the Skardu city area. Fire ants were observed feeding on the honey dews. As there is no controlled grazing in the area therefore inhabitants have covered the tree trunks of different species especially poplar with cloth in order to protect their trees from the expected damage caused by the livestock grazing. It was observed that this practice was also providing an excellent over-wintering/egg laying place for the pest.

Sadpara village which is approximately 10-15 KMs from Skardu city was also visited for the pest presence but there was no pest incidence recorded in the area.

For making the observations on pest incidence, adjoining Shigar valley and agricultural farm owned by Agriculture Department NAs at Hashopi was also visited. Mealy bug has not yet attacked the plantation in this valley. Agricultural farm, private fruit plantations and forest plants were also observed in Kachura area. Mealy bug attack was not recorded in this vicinity also.

3.6 Meetings with the Organizations involved in NRM interventions

During the field visit, meetings were held with the key officials of the organizations involved in undertaking NRM interventions. Following are the details:



**Muhammad Zaman (Manager Institutional Development)
Aga Khan Rural Support Programme, Skardu, Baltistan**

Mr. Zaman briefly explained the history of AKRSP's interventions in Baltistan. He also explained the role played by AKRSP in making efforts to improve the livelihoods of the rural communities focusing on NRM. AKRSP was instrumental in financing biological control of woolly aphid in Baltistan from 2005 to 2007. Now focus of AKRSP is building the capacity of local communities to take their own decisions through Local Support Organizations (LSOs). They are not directly involved in NRM interventions rather they support the capacity building of the members of LSOs

Regarding the mealy bug out break he was of the opinion that it was first observed three to four years before attacking willow trees but now this pest has invaded all plants. This year upon the request of district council AKRSP has contributed an amount of Rs. 30,000. This amount was transferred to Agriculture Department Skardu to help fight against this menace. There are still no specific plans for the management of this pest.

**Muhammad Raza (Deputy Director Agriculture Skardu)
Agriculture Department Northern Areas**

Mr. Raza seemed very much concerned regarding the out break of this pest. Farming community is looking towards the agriculture department for the management of this pest. This year the infestation was very high and during June-July tree trunks and main branches were covered with white wool which is present on the body of the insect. He said that the unpleasant smell of the excretions (honey dews) was very much obvious. Upon the request of District Council as well as farming community they initiated spray campaign during August in order to control the pest. As agriculture department is lacking man power as well as finances therefore other organizations active in the area financially supported the campaign, but this campaign does not produced desired results. The pesticide application was of little help as the body of the insect is covered by wool and wax which makes pesticide action rather impossible. They also have tried putting in gunny bag bands on the fruit tree trunks which minimized the upward movement of the insect but it is rather impossible for the people to cover each and every tree within the surrounding areas. Agriculture Department is also managing IPM laboratory at Skardu where they mainly focus on apple woolly aphid. They have tried to look at the natural enemies but were unable to observe or record any. He also mentioned that he has received reports from the farming communities regarding the deaths of animals which fed on the fallen foliage covered by the secretions (honey dews) of this pest.

Regarding the mealy bug out break he was of the opinion that it was first observed during 2001-02 firstly on willow and poplar, during 2004-05 this pest started invading fruit plants in Skardu. During 2008, the pest invasion was worst and farming community has registered their concerns in the local newspaper as well as to district administration. During July 2008, farming community recorded their concerns by holding protests in the city as well as in front of their office. As apple woolly aphid management by adopting biological control proved successful therefore the department is anxious to take on-board any ecological friendly options. They were requesting special attention by the concerned ministries to help them in fighting this menace as this is now seriously affecting agriculture as well as forestry of the area.



**Khadim Abbass (Range Forest Officer)
Forest Department, Northern Areas**

Mr. Abbass was very much concerned about the pest outbreak. Regarding the pest outbreak he said that this pest was first observed on the forest plants (willow and poplar). He has mentioned this to the higher authorities in this connection as well as he requested Pakistan Forest Institute for support.

Regarding the management of this pest he said that this cannot be managed with pesticides alone, there needs to be a comprehensive management strategy for this pest.

For this year they have contributed Rs. 30,000 to support agriculture department's efforts upon the request of district council mainly to purchase pesticides and support in mobility.

**Muhammad Ayub (Scientific Officer)
Pakistan Agricultural Research Council**

PARC is having an office and field trial area in Skardu. Regarding the mealy bug outbreak, they have reported this pest issue to the NARC colleagues and sought support. But still they do not have main interventions focusing this pest. They reported that the pest first attacked willow during 2005 and then was found invading different forest as well as fruit trees.

**Muhammad Zahid (National Project Director Integrated Pest Management
Project NAs) Agriculture Department Northern Areas**

According to Mr. Zahid their project is focusing on the capacity building of the department and the farming community regarding IPM by using ToF/FFS approach. They have strong linkage with the national IPM Programme who are contracted as the master facilitators for season long IPM sessions. They are concerned about the outbreak of this particular pest and are very enthusiastic to learn about the management of this menace. They also want to incorporate the management strategies and options in their training modules.

**Haider Raza (Manager IUCN)
Northern Areas Programme**

IUCN NAs Office was established in 1995 and worked on National Strategy for Sustainable Development with background papers for eighteen different sectors. They have implemented different conservation projects in NAs. Now they are focusing on culture, heritage, education and water quality surveillance. At the moment they are not implementing projects in NRM sector.

Regarding the outbreak of the pest, they are not yet planning any interventions. Mr. Haider very kindly managed to arrange a visit within the Gilgit City to have the observations regarding the mealy bug attacking forest plants.

**Mr. Abdul Wahid (Director Agriculture)
Agriculture Department Northern Areas**

In a meeting with the Director he explained this outbreak in Skardu especially due to the indiscriminate use of pesticides. He was of the opinion that had the pesticides



used sensibly this problem would not have evoked by quoting the presence of the same pest in Gilgit and not creating havoc because of no pesticide use for its management.

Mr. Iqbal Hussain (Coordinator IPM)
Agriculture Department Northern Areas

As a focal person for pest management in the NAs Mr. Iqbal showed his concerns over the pest's outbreak in Skardu. This year they have tried pesticides as a potential option for the management of mealy bug but were not satisfied by the results. They want to have certain sustainable and ecological friendly management options. For this they have made field collections and were successful in recording coccinellid (lady bird beetle) specie, which was the same as collected by the visiting team from the field. They require Government's support (technical as well as financial) to tackle this menace as they have financial constraints to do area wide management of this new pest.

Mr. Musa Ali & Mr. Zakir (Agriculture Officers)
Agriculture Department Northern Areas

Both the AOs facilitated the visiting team during the visit to Skardu. They took the team to areas having pest infestation and provided necessary background information.

Raja Jalal Hussain Maqpon (Chairman)
District Council Skardu

The visiting team met Raja Jalal as he was the person who brought forward this issue to the relevant Ministries. As he is heading the local government setup and also peoples' voice, showed his deep concerns regarding this pest. He extended his all out support during the visit and is willing to extend all possible support in future to help manage this pest.

3.7 Stakeholders' meeting

Upon the request of visiting team, District Chairman arranged one day meeting at his office by inviting different stakeholders' to discuss the pest situation.

The meeting was chaired by the Chairman District Council. Haji Fida Muhammad Nashad Member Legislative Assembly (Former Deputy Chief Executive) NAs also participated in the meeting. The farmer representative should their concerns and worries regarding this new pest which has invaded their plantations.

The representatives from different government line agencies also raised their concerns as they are unable to manage the pest by conventional methods.





All the stakeholders stand united to any efforts made or proposed to effective management of this pest. They all requested Government of Pakistan to intervene through relevant ministries to develop ecological friendly management options.

The District Council Chairman and Member Legislative Assembly extended all possible support to any efforts made in this regard.

3.8 Interventions and efforts by different organizations

Following is the brief description of efforts made by different departments or Organizations for the management of this pest:

Agriculture Department Skardu: Since 2006, the department has started awareness campaign among the farming communities and launched three spray campaigns during 2006-08. The results of spraying campaigns are not encouraging therefore the department is eager to take on board other options with the support of Government of Pakistan.

District Council Skardu: They have financially (Rs. 25,000) contributed in the efforts made by Agriculture Department.

Municipal Committee Skardu: They have financially (Rs. 20,000) contributed in the efforts made by Agriculture Department.

AKRSP Skardu: For the mealy bug issue, AKRSP has also financially (Rs. 30,000) contributed in the efforts made by Agriculture Department.

Forest Department Skardu: They have financially (Rs. 30,000) contributed in the efforts made by Agriculture Department.

Tourism Department Skardu: From their resources they have financially (Rs. 10,000) contributed in the efforts made by Agriculture Department.

3.9 Here say

There are different stories related to the introduction of this pest in Skardu. Some details are narrated in the following paragraphs:

Few farmers during the stakeholders' meeting stated that the pest was introduced with the mangoes brought to the local market from the down country. The pest was inside the wooden crates and later escaped and established on the willow trees and afterwards invaded different plantations.

Some of the people were of the opinion that the pest was introduced through citrus and poplar saplings brought in the area from different sources and different parts of the country for distribution among the local communities.

Couple of people say that this pest came into the area via empty gunny bags brought from the down country areas for potato packing and transportation.



Most convincing of all the here say was introduction of this pest through the fire wood which is brought into the area from the forests of Chilas during winter season as eggs and during the following spring pest hatched and first established on willow and gradually invaded other plantation.

3.10 Conclusions

Based on the field survey and meetings with all different stakeholders following conclusions can be made:

- The pest species recorded is different from the mealy bugs attacking cotton, citrus, mango and sugarcane.
- For authentic identifications, samples of both mealy bug and its predator were sent to Natural History Museum UK. Mealy bug has been identified as *Drosicha* sp. det. Martin & Gullan (Monophlebidae: Coccoidea: Hemiptera) and its predator as *Sumnius vestitus* (Mulsant) det. Booth (Coccinellidae: Coleoptera).

3.11 Recommendations

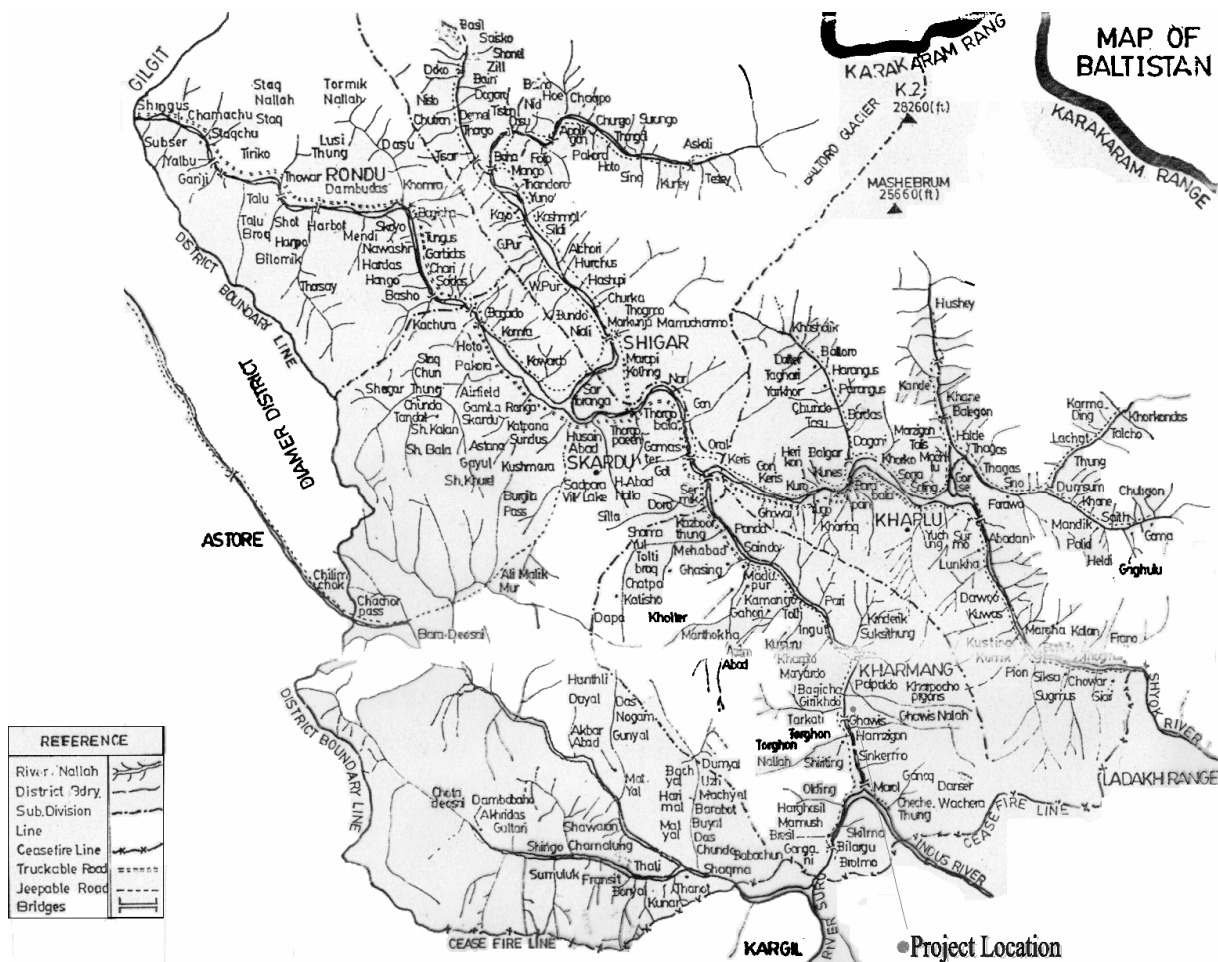
Following are the recommendations based on field survey and meetings with different stakeholders:

- Thorough studies related to the pest's biology and ecological aspects in order to design appropriate and sustainable management strategy are needed
- Exploration of natural enemies associated with the pest and developing of their mass culturing protocols
- As an immediate action one year research to explore pest and its natural enemies by involving all relevant stakeholders followed by a comprehensive pest management programme including capacity building of the farming community, agriculture department, forest department and relevant non-government organizations, is needed.

3.12.1 Copy of the fax from Chairman District Council

TOTAL P.03

3.12.2 Map of Baltistan



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مسکروں و رشتوں پر کیڑے کا حملہ: سپرے شروع کر دیا گیا

ایک برقی صفحہ پر آج آٹھ سالہ خلیل نے بھی حملہ ہو کر لے لیا: محمد رضا

مگر (ایم این پی) مسکروں کے حملہ اور غیر محار

واقعات کیوں کے لئے ہے ہمہ گیر شروع کر دیا ہے

جانب سے جاری ہے کہ لوگ بھی زراعت کے خدان کو گریے

آج 31 ستمبر 31

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محمد رضا

ہیں کہ یہی صورت حال جاری ہے آج آٹھ سالہ خلیل نے بھی حملہ کر دیا ہے کہ جس کا حملہ اور غیر محار

زراعت مسکروں کی آواز بھر رہا ہے مینڈا کو تھکا کر

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آ کر کیا ہے اور آج ان کی سب سے قیام اور واقعات کے ہمہ گیر

کر رہی ہے کہ ہمال کے جانب میں انہوں نے کہا کہ

بہت سے فحاشی کیڑے ہیں اور ان کی تعداد میں روز

مختلف ہو رہی ہے کہ انہوں نے کہا کہ مسکروں کی بک

خلیلوں پر حملہ کر رہے ہیں مگر مواہم چاہے کہ اس کی بہت

روک تھام کی ضرورت ہے کہ خلیل کو بھی اور تمام رشتوں

پر بھی لگائی جائے کہ اس کی طرف سے اس کی طرف سے اس

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کامل کر لیں

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درختوں پر سپرے کے لئے لوگ تعاون نہیں کر رہے: محمد رضا عوام کا تعاون رہا تو بھر پور انداز میں مہم کو کامیاب کرنا چاہتے ہیں

سرحد (نامہ نگار) سرحد کے چل در اور دیگر محل دار درختوں پر لڑکوں کے حملے کے بعد سپرے خریدا کر دیا ہے تاہم ملانے کی سب سے محظوظ وزارت سے تعاون نہیں کر رہے ہیں۔ اگر اسی صورت حال جاری رہی تو چند سال ہی ضلوں میں ہر جگہ سپرے کے بعد صورتحال سنگین ہو جائے گی۔

(بانی صفحہ 45)

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ٹیبل فرم کرادی ہے۔ لیکن سوال کے جواب میں انہوں نے کہا کہ یہ بہت ہی خوبصورت چیز ہے۔ اور اس کی تعداد میں روز بروز اضافہ ہو رہی ہے جس کے بعد عیش و عشرت کے ماحول میں یہ خصوصیات بھی لگائی جائیں گے۔ عوام کو چاہئے کہ اس کی بدولت روک تھام کے لئے تنگ سے تعاون کریں۔ اور ساتھ ساتھ مقامی درختوں پر ہرے کر دہیں۔ ابتداء کے سہارے میں اس کی افزائش ایک جاسنے کی طرح ہوتی ہے۔ اور اچھے ماحول میں روز بروز ہرے کے اس کو عمل ختم کرنے کی کوشش کریں گے۔ انہوں نے مزید کہا کہ کنفیڈریسی کی وجہ سے 1991ء صاب تک ہرے کم شروع نہیں کی جاسکتے تھے۔ یہ مسئلہ

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3.12.4 Key people met

S. No	Name	Department/Organization
1.	Raja Jalal Hussain Maqpon	Chairman, District Council Skardu
2.	Haji Fida Mohammad Nashad	Member Legislative Assembly NAs
3.	Muhammad Raza	Deputy Director Agriculture Skardu
4.	Mohammad Zaman	Manager Institutional Development, AKRSP Skardu
5.	Musa Ali Hashmi	Agriculture Officer, Skardu
6.	Zakir Hussain	Agriculture Officer, Skardu
7.	Muhammad Ayub	Scientific Officer, PARC Skardu
8.	Khadim Abbass	Range Forest Officer, Forest Department NAs
9.	Abdul Wahid	Director, Agriculture Department NAs
10.	Iqbal Hussain	Coordinator IPM, Agriculture Department NAs
11.	Haider Raza	Manager, IUCN NA Programme
12.	Muhammad Ali	Scientific Officer, Agriculture Department NAs
13.	Muhammad Jaffar	Member District Council, Skardu
14.	Muhammad Ismail	Member District Council, Skardu
15.	Muhammad Ali Nashad	Chairman Municipal Committee Skardu
16.	Wazir Fida Hussain	Member District Council, Skardu
17.	Ghulam Abbass	Member District Council Skardu
18.	Ghulam Hussain	Farmer Skardu
19.	Rustum Ali	Farmer Skardu
20.	Fida Muhammad	Farmer Skardu
21.	Muhammad Yousaf	Farmer Skardu



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