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Trans-boundary Plant Pests and Diseases in the Near East; with the Emphasis on Wheat Stem Black Rust (Ug99)

CONTENTS

I. Background

1. In recent years, the world has witnessed an increase in both the frequency and severity of trans-boundary pests and diseases. Invading pests and diseases – associated with trade in produce or with the movement of plant materials - may lead to large-scale outbreaks that have the potential to wipe out vast cropped areas. Extreme weather events associated with climate change also may spread pests and diseases beyond their normal ranges, while reduced genetic diversity in cropping systems can increase susceptibility to damage. If such infestations or infections are not detected in a timely manner, they may have serious consequences for overall agricultural production and food security.
2. Plant quarantines and other schemes to ensure the safe international trade of agricultural commodities may be partly effective at limiting the spread of pests and/or disease. However, pests and diseases can spread even without human intervention, for example when pathogens are carried by insect vectors.
3. At present, a number of emerging pests and diseases that prey on staple crops are threatening local or regional food security and the livelihoods of millions of people. Often, this occurs in the poorest countries, those which tend to lack the capacity to develop practical approaches to prevent or anticipate the arrival of these pandemic pests and diseases or, in a second stage, to manage and control them.
4. Regional cooperation and coordination, including timely information sharing, are critical to reducing the impact of trans-boundary pests and diseases.
5. This objective of this document is to highlight the present situation of trans-boundary threats in the Near East Region, including the tomato fruit miner, the red palm weevil, the peach fruit fly, the desert locust and the new virulent strains of wheat rusts. The paper looks at the status of preparedness of countries in the Region; how well equipped are they to respond effectively to these threats and to take the actions needed to improve their response.

II. Important Trans-boundary Plant Pests in the Near East Region

(A)Tomato Leaf Miner

6. *Tuta absoluta* attacks the tomato and other Solanaceae species such as the potato and the eggplant. It was first detected in Spain in 2006, and then spread rapidly across Southern Europe and North Africa. The pest larvae mine the leaves producing large galleries and then burrow into the fruit, causing a substantial loss of tomato production in both protected and open-field cultivations. In the case of the potato, only the aerial parts are usually attacked, although recently damage to tubers has also been reported.
7. FAO is assisting Saudi Arabia, UAE and Yemen in their efforts to detect this pest, and a number of pheromone traps have been distributed to the plant protection authorities in these countries. Several biocontrol agents also have proved effective in the management of this pest.
8. Chemicals have been the main control measure used to protect against against *Tuta absoluta*. However, in South America frequent and intense applications of insecticides have led the species to develop resistance to some of these biological agents.
9. Good agricultural practices (GAP) can help in reducing the pest infestation. These include: rotation with crops outside the *solanacae* family, adequate fertilization, irrigation, and the destruction of infested plants and post harvest debris. Integrated pest management strategies have also been developed in South America to control this pest. These employ the following methods: massive trapping before planting, cleaning the soil of crop residues and the targeted use of recommended pesticides.

(B) Peach Fruit Fly (PFF)

10. The peach fruit fly (*Bactocera zonata*) is a native of South East Asia where it infests some of the main commercial fruit and vegetable crops including citrus, peach, mango, and tomatoes. Within the Near East, the presence of this insect has been reported in Saudi Arabia, Egypt, Yemen and Libya. The pest is known to infest over 30 species of commercial fruit and vegetables causing up to 30 percent damage despite insecticide treatment and losses of up to 100 percent in cases where no preventive measures have been adopted. Field observations and studies have indicated that this pest is capable of spreading along great distances by natural means and that it is at least as aggressive as the Mediterranean fruit fly (*Ceratitis capitata*) and the oriental fruit fly (*Bacterocera dorsalis*). In Egypt, field observations and studies indicate that the PFF has already established itself there and in some areas of the country has replaced the Mediterranean fruit fly.
11. Should this pest spread to PFF-free countries around the Mediterranean basin and become established there, the economic impact on the domestic and export fruit market could be in the order of billions of dollars per year. This would be a consequence not only of increased direct damage, but of the cost of insecticide use, quarantine restrictions, certification programmes (including post harvest treatment) and overall environmental impact. For instance, in Egypt total losses due to PFF damage to the country's main fruit crops is now estimated at *$*US177 million per year.
12. To minimize the potential impact of this pest the following is recommended:
    - create a technical dialogue between trading partners;
    - prohibit the importation of PFF hosts from infested areas;
    - enhance internal and external phytosanitary measures;
    - implement international standards for pest free areas (ISPM 10) and phytosanitary certification (ISPM 12); and
    - treat fruit (where appropriate) before export (storage at 1.7 C for two weeks) in order to destroy all PFF life-cycle stages.
13. FAO has proposed a regional project (TCP/RAB/2902A) entitled Peach Fruit Fly Management in the Near East and North Africa. The focus would be on:
    - identification of the principle fruit flies present in the Region;
    - supply of the materials needed for PFF monitoring, detection and phytosanaitry control measures and strategy;
    - support for building awareness, enhancing extension and information exchange;
    - capacity development to improve the control of this pest on national and regional levels; and
    - strengthening of the national and regional quarantine measures needed for PFF control.

(C) Red Palm Weevil (RPW)

14. Red palm weevil (RPW), *Rhynchophorus ferrugineus*, is a beetle that can attack on as many as 19 palm species worldwide, and can be lethal. First reported on coconut palms in South Asia as long ago as 20 years, it has since been observed on date palms (*Phoenix dactylifera)* in several countries of the Region, and subsequently – through the movement of infested planting material – made its appearance, first in Africa and later in the Mediterranean region of Europe and in North America.
15. In affected EU member countries, the absence of effective preventive regulation has contributed to the spread of this pest. The EU subsequently issued a directive to prevent the introduction and spread of *Rynchophrus ferrugineus* within EU member counties. This directive includes the following restrictions:

- palm trees imported from outside the EU must come from pest-free areas and be accompanied by a plant passport issued in accordance with the provisions of EU Directive 92/105/ECC. (Protective Measures Against the Introduction into the Community of Organisms that Harmful to Plants or Plant Products and Against their Spread within the Community);
- palm trees originating in the EU may be transported outside their place of origin in a member state only if they are accompanied by a plant passport as indicated above.

16. Management of this serious plant pest will require integrated approaches, including:
    - the control of plant transport and the adoption of strict quarantine measures between and inside countries which are affected and/or threatened by the pest;
    - trapping, preventive treatment, inspection, the removal and destruction of infested plants;
    - installation of monitoring/trapping systems (with insecticides for the preventive treatments of neighboring palms in case of pest detection);
    - implementation of applied research programmes closely linked to the stakeholders involved in eradication programmes.

III. Desert Locust

17. The desert locust (*Schistocera gregari*a) is the best known trans-boundary plant pest because of the scale that its infestations reach when plagues are fully developed. The desert locust therefore continues to be a top priority within FAO's efforts to prevent, control and minimize locust impact on the livelihoods of rural populations in Africa, the Near and Middle East as well as in South-West Asia.
18. Crop damage due to locust attack has been shown to aggravate significantly the severity of a number of famines in Africa. Depending on ecological and meteorological conditions, desert locust outbreaks re-occur at various times within the area stretching from Mauritania to India whenever the combination of rainfall and vegetation permits population concentration and reproduction of this pest. Since the start of the twentieth century, desert locust upsurges and plagues have occurred in 1926–1934, 1940–1948, 1949–1963, 1967–1969, 1986–1989 and most recently in 2003–2005.
19. In response to concerns related to the economic and ecological impacts of large-scale pest control operations, the desert locust component of EMPRES (Emergency Prevention System for Trans-boundary Animal and Plant Pests and Diseases) was initiated by FAO in 1994. Its purpose was to improve the preventive management capacity of locust-affected countries in order to help them minimize the risk of these plagues with the objective of reducing damage to livelihoods. EMPRES was designed as a programme in which affected countries, regional organizations, donors and FAO would collaborate in the development of improved preventive control measures. The programme began in 1997 in what is known as the Central Region, covering 9 countries around the Red Sea (Djibouti, Egypt, Eritrea, Ethiopia, Oman, Saudi Arabia, Somalia, Sudan and Yemen) and lasted for 10 years. Thereafter, the Regional FAO Commission for Controlling the Desert Locust in the Central Region (CRC) took over EMPRES activities. In 2006, the EMPRES concept was expanded to the Western Region, covering an additional 9 countries in Northwest and West Africa (Algeria, Chad, Mali, Mauritania, Morocco, Niger, Libya, Senegal and Tunisia).
20. Desert locust preventive control remains a constant challenge because the pest has no permanent outbreak areas from which swarms escape to start a plague. Instead, adults migrate to breed in invaded areas that have been turned into fertile breeding zones by winter, spring or summer rains. The erratic nature of their breeding patterns makes permanent monitoring of the ecological conditions of the potential breeding areas indispensable. In the past, national locust control units failed to reach a high degree of preparedness with the result that as a new upsurge developed they

found themselves in need of international financing for the replacement and/or replenishment of much-needed equipment.

21. Several lessons can be drawn from the past and should be taken into consideration by national pest control programmes, FAO, EMPRES, the Regional Locust Commissions and donors.

- Although possession of adequate resources at stand-by (even in calm periods) is definitely important, the effective coordination and timely use of these resources is probably even more important.
- Insufficient resources, difficult terrain and political and military insecurity work together to make it difficult to conduct much-needed ground surveys.
- Prevention and pest control cannot be achieved without strong national support at all levels and without a sufficient level of preparedness on the part of national locust centers.
- Initial outbreaks tend to occur locally within relatively small areas (1,000–6,000 km2) that can be difficult to detect and to access.
- Rapid intervention is not always possible due to a lack of resources or political insecurity. In such situations, accurate forecasts would play an even greater role in allowing neighbouring countries to plan for potential pest invasions.
- Local sources of information, such as that provided by nomads, are important and should be a part of every national information system. But they are not a substitute for proactive field surveys by experienced pest control teams.

IV. Wheat Rusts, Stem Rust (UG99) and the Yellow Rust

(A) Introduction

22. Countries in the Near East rely heavily on wheat production for their subsistence and livelihood. Wheat production in the Region, however, is threatened by a variety of biotic and abiotic stresses, the most important of which are: drought, the Sunn pest and rust diseases. Wheat rust fungi, whether stem (black) rust, stripe (yellow) rust or leaf (brown) rust have co-existed with wheat since its earliest cultivation and their presence is on record throughout the world wherever wheat is grown.
23. The extent of crop losses depends on the interaction between pathogen characteristics, host susceptibility and environment at the local, regional and global levels. On susceptible wheat cultivars, losses of up to 60 percent are possible in the case of yellow rust and of 70–100 percent in that of stem rust.
24. In the past century, global wheat production has witnessed a significant reduction in the genetic diversity of the varieties cultivated, with mega varieties grown on an ever larger land area. This has increased the risk of regional and global epidemics resulting from wheat rusts. Indeed, the world already has witnessed several such epidemics that caused losses estimated in billions of dollars.
25. This section highlights the present situation in the Near East Region: the wheat rusts that are threatening wheat production, the degree of preparedness existing in the Region's countries to prevent or respond effectively to such threats and the actions needed to improve this response.

(B) Development of Wheat Rust Epidemics

26. Wheat rusts produce large number of spores that, under favorable conditions can result in epidemics. These rusts can also easily evolve into new races that can render ineffective the genetic resistance of host plant wheat varieties.
27. The use of rust-resistant varieties is by far the most economic and effective way of controlling wheat rusts. Fungicide application is usually not economically feasible on wheat, especially in developing countries. Cultural practices such as changing planting dates, destroying volunteer

and alternate host plants and using early- maturing varieties, multi-lines or varietal mixtures also may be effective in reducing the levels of inoculum over an extensive wheat area.

28. Wheat breeders today rely heavily on the utilization and deployment of resistance race-specific genes in their breeding programmes. This approach is attractive because it is relatively simple to incorporate such genes into improved germplasm and because it provides crops with complete, although temporary, protection. However, this can have only a limited effect because of the ability of wheat rusts to evolve into new races that break down the effectiveness of these genes.

29. If the new races of rust that emerge are hardy enough to flourish in the surrounding environment and if they find a susceptible host variety, they will become established in an area and under favorable environmental conditions will cause epidemics. These new rust races, borne by the wind, then migrate for short or long distances, to invade new areas planted with susceptible wheat varieties.

(C) Global Rust Threats: Stem Rust (Ug99) and Yellow Rust (Yr27) Strains

30. Ug99 was first identified in East Africa as a new race of stem rust capable of overcoming all major genes of resistant wheat. Since its detection, new variants of Ug99 have evolved with the result that over 80 percent of all commercially-grown wheat varieties are now highly susceptible to stem rust. This demonstrates the extreme vulnerability of a global staple food crop.

31. Presently, Ug99 or its variants have been confirmed in Uganda, Kenya, Ethiopia, Sudan, Yemen, and the Islamic Republic of Iran. In 2009, the presence of Ug99 was reported from previously unaffected areas of Yemen and the I.R. Iran. In 2010, Ug99 has been also reported from Tanzania and South Africa

32. Based on wind movements, past experiences and the presence of susceptible cultivars, countries in the Near East, in Eastern and North Africa and in Central and South Asia – countries that, together, account for around 80 million hectares of wheat – are at high risk of the disease. Based on a realistic assumption that the disease can cause an average yield loss of 10 percent, if these areas were to come under attack by Ug99, the resulting losses would be in the billions of dollars.

33. Similarly, during the 1980s, the majority of wheat growing areas in the Near East Region were under cultivation with high-yield wheat varieties that carried a common resistance gene to stripe (yellow) rust (Yr9*).* The emergence and establishment throughout the Region of yellow rust races with virulence for Yr9 resulted in large-scale yellow rust epidemics during the 1980s and 1990s that completely eliminated the crops along its path of migration. Examples of the massive crop losses that can be caused by wheat yellow rust, were the epidemics in the I.R. of Iran in 1992 and 1994 when, respectively, 1 million and 1.2 million tonnes of wheat were destroyed.

34. Following the Yr9 epidemics, replacement wheat varieties were introduced but many of these were protected predominantly by the Yr27 resistance gene. A region-wide breakdown of this gene was reported in South Asia in 2002–2004. In addition, since 2000 two new aggressive strains of yellow or stripe rust capable of adapting to warmer temperatures have been identified. These strains exhibit shorter latent periods and higher spore production levels than others. They have spread across continents probably faster than any other major crop pathogen, causing major outbreaks in several regions.

35. In 2009, favourable environmental conditions for stripe rust resulted in serious outbreaks in several countries, including Morocco, Uzbekistan, Turkey, Azerbaijan, Algeria and Afghanistan. Virulence for Yr27 was confirmed in many of these outbreaks. Detailed studies of the disease made in Morocco at that time showed that the estimated mean loss for the Achtar variety there during the 2009 season was 0.5 ton/ha, with a corresponding estimated financial loss of approximately US$30 million.

36. Conditions favouring rust development have continued into 2010 during which reports of serious outbreaks of stripe rust have been received from Syria, Iraq, Turkey, Azerbaijan, Uzbekistan, Morocco, and Lebanon. Stripe rust incidences have also been observed on susceptible cultivars, in the northern, southern and western parts of the I.R. of Iran. Overall losses in the Region for 2010 were more severe than in 2009, with estimated losses of 1.25 million tonnes in Syria alone.

(D) Global Response to Ug99 and other Wheat Rust Strains

37. In response to Ug99, a coordinating mechanism for global activities regarding wheat rusts was initiated, namely the Borlaug Global Rust Initiative. [1] Originally, it was chaired by the late Dr. Norman Borlaug with an executive committee made up of representatives from its permanent members, namely the International Centre for Agricultural Research in the Dry Areas (ICARDA), the International Maize and Wheat Improvement Center (CIMMYT), Cornell University, FAO and the Government of India.
38. Under the umbrella of the Borlaug Initiative, several joint activities were undertaken. These included:
    - breeding for resistance using traditional and innovative methods;
    - disease surveillance and monitoring and national capacity development in race analysis;
    - testing of the varieties and breeding lines received from all countries at the Ug99 nurseries established in Kenya and Ethiopia;
    - support to concerned countries in promoting and implementing rapid seed multiplication of developed resistant varieties.
39. FAO developed a Wheat Rust Disease Global Programme which coordinates all its wheat rust activities. This is part of the expanded EMPRES plants component and is also considered a part of the newly-established Food Chain Crisis Management Framework.
40. This Wheat Rust Global Programme aims at the prevention and management of emerging wheat rust diseases and the enhancement of wheat productivity. To achieve these goals, FAO is working in close collaboration and partnership with national governments, international agricultural research centers and other international institutions.
41. Based on the estimated risks of Ug99 migration and on the needs of the various countries involved, the Programme has prioritized its activities in over 30 countries considered affected or at risk of Ug99 and other wheat rusts in the regions of East and North Africa, of the Near East and Central and of South Asia. Ug99 (and its varants) and yellow rust are considered equally important.
42. As a neutral international forum and through its linkages with regional bodies, with international agriculture research and development institutions and with the donor community, FAO is at a clear advantage as the leader of international efforts in this sector. Indeed, a major contribution of the programme is the enhancement of regional and international cooperation and information sharing.

(E) Achievements

43. Wheat Rust Disease Global Programme activities undertaken in the Region included:

Awareness raising and contingency planning workshops for improved country preparedness.

44. International, regional and national workshops were conducted for technical policy makers as part of a programme to raise awareness of the status and threats of wheat rusts and of the importance of contingency planning for countries set on preventing the occurrence of, or effectively responding to potential wheat rust epidemics.

Enhancement of surveillance and early warning systems, including virulence tracking.

45. Using the experience of the Desert Locust Information System model, FAO established the Global Wheat Rust Monitoring System. The system manages, analyzes and globally shares survey

[1] Named after its chair, U.S. Agronomist Dr. Norman Borlaug, Nobel Peace Prize Winner in 1970 and widely acclaimed as the "Father of the Green Revolution".

data coming from the field. Significant progress was made rapidly as a result of strong commitments from national counterparts in collecting and sharing national rust survey data (including race analysis data). The information is provided by national surveillance teams using harmonized surveillance protocols in the context of an international rust surveillance network. Field databases and their applications are forwarded to Rust SPORE, a new web-based information portal for the dissemination of worldwide surveillance and monitoring information and for tracking the advance of Ug99 and its variants. (http://www.fao.org/agriculture/crops/rust/stem/en/).

Enhancement of national varietal registration and seed systems for rapid multiplication and distribution of quality seeds of resistant wheat varieties.

46. Institutional capacity development for fast-track release of resistant varieties, rapid seed multiplication and distribution of wheat rust resistant varieties are being promoted through training of technical policy-makers from the national seed sectors and through country needs-assessments. Improved information exchange and regional cooperation is also enhanced through traveling workshops for participants from the Region.

Improvement of wheat rust management at the field level through participatory farmer training to reduce risk and improve yields under local farming conditions.

47. Participatory training programmes in both Pakistan and Yemen were held for extension agents and wheat farmers with the direct intervention of researchers. These included training of trainer courses, the establishment of farmer field schools and farmer study groups, all of which were designed to improve farmers' wheat management practices with emphasis on rusts.
48. A major outcome of these activities was a general assessment of the situation and of the needs of countries in the Region concerning their preparedness to deal with the threat posed by wheat rusts.

(F) Challenges for the Near East in Facing Threatening Races of Wheat Rusts

49. The level of awareness of wheat rust threats including Ug99 by concerned stakeholders in the Region is generally low, usually limited to the scientists who work on the disease.
50. One constraint common to the Region is the limited national coordination and weak information-sharing mechanism between concerned ministries and institutes. This limits countries' capacities to effectively respond to potential disease threats.
51. Field surveys for wheat rusts remain sporadic and incomplete in most countries of the Region. Furthermore, survey results are not always shared with and effectively utilized by concerned stakeholders.
52. Few countries in the Region have sufficient human and infrastructural resources to undertake wheat rust race analysis on a national level. However, even those countries with good facilities may need further training support to obtain reliable data.
53. Wheat rusts continue to be managed mainly through the use of resistant varieties. In some countries fungicides are used primarily for the control of yellow rust epidemics. Furthermore, it should be remembered that not all countries have full-fledged wheat breeding programmes and therefore tend to rely on breeding material received from international research centers (mainly ICARDA and CIMMYT) for their wheat improvement. Breeders and wheat scientists in most countries have sent local or improved varieties for testing in the Ug99 international nurseries in Kenya and Ethiopia.
54. Most countries in the Region do not possess sufficient diversity in the range of resistance genes available for commercial wheat varieties, thereby increasing the risk of future rust epidemics.
55. While many countries in the Region have effective varietal registration and seed multiplication systems, these are not all fully functional, which could be a serious problem given the need for a quick and effective response to wheat rust epidemics. Areas that still need to be tackled include:
    - rapid variety registration procedures that do not compromise quality;
    - national capacities for rapid seed multiplication in terms of systems, equipment, infrastructure and quality control;

- improved communication regarding the evolution of wheat rust races, defeated resistance genes and the availability of alternative resistant varieties among breeders, wheat variety registration committees and seed multiplication and extension systems

56. Although there are several wheat varieties identified as resistant to Ug99 and other wheat rusts, in most countries in the Region (probably with the exception of such countries as Egypt and the I.R. of Iran), most farmers are still using older, highly susceptible varieties. The involvement of farmers at an early stage in the selection and evaluation of varieties is critical for the adoption and replacement of highly susceptible varieties as a means of reducing the risk of large-scale epidemics.

57. Extension systems across the Region tend to be weak due to decades of under-funding. Accordingly, the introduction of new technologies and varieties to farmers has been constrained, as has been their potentially useful feedback to research and policy makers.

V. The Near East Plant Protection Organization (NEPPO)

58. In 1993, an agreement was signed for the creation of the Near East Plant Protection Organization (NEPPO), which entered into force on 8 January 2009 following the ratification or accession by 10 countries from the Region.[2] NEPPO will be hosted by the Moroccan Ministry of Agriculture and is one of the several regional plant protection organizations (RPPOs) that are officially recognized and that work closely with the International Plant Protection Convention. It is an inter-governmental organization functioning as a coordinating body for the Region's national plant protection organizations (NPPOs).

59. As per Article IX of the Convention, the regional organizations are to participate in various activities designed to bring about the Convention's objectives. The article extends their responsibilities to cooperation with the IPPC secretariat as well as with FAO's Commission for Phytosanitary Measures in working to develop international standards

60. The functions of NEPPO (as is the case with the functions of other regional organizations) are laid out for the most part in Article IX of the Convention and include:

- coordination of and participation in NEPPO activities designed to promote and achieve the objectives of the IPPC;
- cooperation within and among regions for promoting harmonized phytosanitary measures;
- collection and dissemination of information, in particular with regard to the IPPC's goals and objectives; and
- cooperation with the CPM and the IPPC secretariat in developing and implementing international standards for phytosanitary measures.

61. NEPPO is expected to develop its own activities and programmes. Every year, a technical consulting body made up of representatives of the regional organizations and the IPPC secretariat will be convened; its function will be to strengthen inter-regional consultation on the harmonization of phytosanitary measures for controlling pests and preventing their spread and, at the same time, to promote the further development and use of the relevant international standards for phytosanitary measures (ISPMs).

[2] Egypt , Sudan , Jordan , Tunisia , Algeria , Morocco, Pakistan , Malta , Syria and Libya

VI. Recommendations

62. **For the Consideration of Member Countries**

Member countries are urged to give due consideration to a series of major issues.

1. Support to phytosanitary (plant quarantine) capacity, including national coordination mechanisms among various ministries; the goal is to build human and infrastructural capacities for the inspection of produce, seed and planting materials, as well as for pest surveillance, all of which are to be in line with the international standards set by the Commission.
2. The need for policy and funding support for national teams that will enable them to undertake regular surveys for pest and disease surveillance and monitoring to detect new pests or changes in the status of pests or diseases.
3. Strengthened collaboration with FAO and the Region's National Plant Protection Organizations, as well as with NEPPO, is needed for the establishment of a regional database. Countries should also work towards reaching agreement on regional guidelines for the harmonization of methods and procedures related to phytosanitary measures and pest management. Support by NEPPO member countries will be needed in the establishment, funding and work programme of NEPPO, as there are potentially many benefits to member countries.
4. National policies and regulations are necessary to enhance awareness among farmers and dealers/traders on the risks associated with pesticides and to develop mechanisms for the effective enforcement of these regulations; these should include rules regarding the improper use of chemical control products and the illegal trade of pesticides. In addition, integrated pest management technologies (IPM) need to be actively promoted throughout the Region.
5. There must be ongoing commitment to the desert locust control organizations in the region with support given to national and global surveillance and information sharing, as well as to the early warning mechanisms that represent a major component in the prevention of potential pest upsurges and their spread.

63. **Specific Recommendations for Wheat Rusts: Emphasis on Ug99**

6. National contingency and preparedness plans for the prevention of and rapid response to the threat of wheat rust epidemics must be developed, with adequate attention to their legislative, technical, infrastructural and financial aspects as well as to the necessary accompanying national institutional and administrative structures.
7. Policy, financial and logistical support must be provided so that national teams can be set up to undertake regular surveillance and monitoring of rusts and other emerging wheat diseases.
8. As appropriate, countries should strengthen variety development and release systems, as well as procedures for rapid multiplication and distribution of wheat rust resistant varieties to farmers
9. Member countries should promote participation in information sharing of the results of field surveys of pathogen races and disease at national, regional and global levels. This should be done through FAO's Global Wheat Rust Monitoring System and the new Rust SPORE Web portal.

64. **FAO is called upon to provide assistance in the following areas:**

1. Providing greater technical and policy support to governments in the development and implementation of national pest control plans and national contingency plans that aim at enhancing the countries' preparedness in preventing and effectively responding to plant pest epidemics and threats;

2. Providing support to countries in the Region in strengthening their national institutional and human capacities, especially in the areas of phytosanitary measures (IPPC) and in effectively responding to transboundary pest and diseases.
3. Especially for the management of wheat rusts, technical support should be provided to countries in the areas of harmonized surveillance and rust race analysis, rapid seed multiplication, seed quality control and certification, as well as farmers' training for the adoption of resistant locally adapted wheat varieties.
4. Promoting regional cooperation mechanisms for sharing innovative technologies, genetic material and experiences so as to enhance preparedness for and response to transboundary pests and diseases;
5. Assisting Member Countries in the development of national and regional plant protection knowledge and information systems for the management of transboundary pests, as part of the existing global networks including the International Plant Protection Convention, NEPPO, the FAO's Global Wheat Rust Monitoring System and the new Rust SPORE Web portal