منظمة الأغذية والزراعة للأمم المتحدة | 联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Agricultura y la Alimentación

# COMMITTEE ON COMMODITY PROBLEMS

## JOINT MEETING OF THE FOURTH SESSION OF THE SUB-GROUP ON BANANAS AND THE FIFTH SESSION OF THE SUB-GROUP ON TROPICAL FRUITS

**Rome, 9 – 11 December 2009**

# PROJECT PROPOSAL FOR SUBMISSION TO THE COMMON FUND FOR COMMODITIES: GREENER BANANAS: REDUCING PESTICIDES AND THE CARBON FOOTPRINT TO BENEFIT CONSUMERS, LABORERS, RURAL INHABITANTS AND THE ENVIRONMENT – A COLLABORATIVE COUNTRY-BASED APPROACH

**1. Title of Project : Greener Bananas:** Reducing pesticides and the carbon footprint to benefit consumers, laborers, rural inhabitants and the environment – a collaborative country-based approach

**2. Working group:**

1. Costa Rica:
   Corbana: Banana Corporation of Costa Rica
   Dr. Jorge Sandoval – Director of Research
   Mauricio Guzman – plant pathologist
   Mario Araya – nematologist

2. Colombia:
   Augura: Asociación de Bananeros de Colombia
   CENIBANANO: Research Center for Banana of AUGURA
   John Jairo Mira, Director of Research

3. Panama:
   IDIAP
   Ing. Rodrigo Morales, Scientist Biological Control

4. Mexico:
   INIFAP
   Dr. Mario Orozco plant pathologist
   Banana Growers of Colima, Mexico
   Banana Growers of Soconusco, Chiapas, Mexico
   Ing. Roman Pacheco, Scientist

**3. Collaborating Regional and International Institutions:**

- Bioversity International, Montpellier, France
- Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France
- Wageningen International, Wageningen, Netherlands
- Queensland Department of Primary Industries, Australia

**4. International Collaborating Scientists:**

- Luis Pocasangre, Charles Staver, Agustin Molina - Bioversity
- Jean Michel Risede, Luc Delapeyre, Philippe Tixiere, Thierry Lescot, Francois Cote (CIRAD)
- Sietze Vellema, Kees Jansen, Jetze Stoorvogel – Wageningen
- Tony Pattison

**Greener Bananas – reducing pesticides and the carbon footprint to benefit consumers, laborers, rural inhabitants and the environment – a collaborative country-based approach**

Cavendish banana is among the world's crops with high levels of pesticide use/ha. The benefits from the reduction of the use of pesticides in banana production are widely recognized. These include the reduction in the exposure to pesticides among workers in banana plantations and the reduction in pesticides in runoff, dust and as drift which contaminate waterways and the lives of rural communities sharing the landscape with banana plantations. These are important factors in the eyes of consumers even if banana exporters follow strictly the pesticide residue limits. Lower rates of pesticide use also benefit growers directly by extending the effectiveness of the pesticides which are used, by reducing the collateral damage to beneficial organisms in soils and by lowering costs.

In 2006 the Common Fund for Commodities funded a fast track proposal for the development of a pesticide reduction plan for banana (PRPB). Under the coordination of Wageningen University, the task force included KUL in Belgium, CIRAD in France and the banana unit of Bioversity based in France. This group mobilized a global network of expertise ranging from genome sequencing, genetic studies on both *Musa* and its diseases, precision agriculture, soil and root health, crop and disease management in the field and innovation systems. They carried out internal workshops and a survey of producing countries and commissioned studies and workshops on special topics. The process culminated in a stakeholder consultation in November 2007 on short, medium and long term pesticide reduction strategies. This workshop brought together over 60 participants from the export banana sector representing Latin America, the Caribbean, Africa and Asia. Participants included growers, field technicians, scientists, NGOs and market interests. Those present in the workshop concluded that there are many opportunities on the medium (5-10 years) and long term (>10 years) requiring basic research, but that on the short term more effective use of existing knowledge could lead to substantial pesticide reduction. This proposal responds directly to this conclusion of the stakeholder workshop.

The participants at the stakeholder meeting made very clear that ecological, social, economic, and political conditions of banana production vary considerable between and within countries and that a feasible international action research programme should take this existing diversity into account. Technological innovation should be sufficiently robust to these different contexts and be widely applicable and/or easily adaptable. The mentioned diversity includes the diversity of producers within countries, the diversity of extension services, and the heterogeneity of agro-ecological zones. This means that a successful development and implementation of technologies such as pest and disease detection tools and services or precision farm management techniques require adaptation to this diversity and heterogeneity. It also requires that the innovation system has the capacity to adapt to this diversity and heterogeneity.

**What are the elements for reducing pesticide use with existing knowledge?**

A survey of countries by the PRPB working group indicated that fungicide use for the control of BLS had increased in recent years due to regulations on certain types of fungicides and pathogen resistance. In Belize since 1995, the number of applications has increased from 44 to 66 applications per year. In Cameroon in the same period the increase has been from 22 to 35 applications (Lapeyre et al 2009). Nematicides are under increasingly strict regulation and their use may be phased out in the near future. Current use is highly variable with up to 4 applications in certain countries and no use in other countries. On the other hand, pesticide use for pest and diseases of the bunch has been declining. Biological control and the use of improved bagging techniques have both contributed to this decline.

The PRPB working group compared practices among a broad cross section of countries around the globe, inventoried options already in commercial use and in pilot stages, and also compared local and national knowledge systems to identify elements useful for a pesticide reduction approach. The important elements, discussed below, were incorporated into this proposal.

***Country-based collaborative approach***

Export banana production is highly competitive among several dominant multi-national companies, emerging and dominant commercial interests in producing countries and buyers from new consuming nations. World supplies hover between overproduction and scarcity often moving from surplus to shortages and back again in months due to natural disasters or political instability. In this overheated competition for markets, the medium term interests of producing countries are often underrepresented. This is especially the case for high pesticide use and the accompanying large carbon footprint of banana. Collaboration is occurring on the consumer side through unified standards such as GlobalGap, but on the production side collaboration is weak. The entities best positioned to collaborate are those which represent country interests for pesticide reduction. These interests include worker safety, environmental externalities, employment opportunities and foreign earnings. Countries which have public-private, public or grower-financed cooperative private technology development programs are positioned to lead a collaborative effort for reducing pesticide use with existing knowledge. These include such countries as Costa Rica, Mexico, Colombia, Panama and Brazil. The benefits of this collaboration would be available as a public good, would motivate other countries to join the approach and thereby contribute to the greater overall robustness of the banana sector worldwide.

***Identify elements in the information, knowledge support and innovation system to accelerate pesticide reduction***

The information, knowledge and innovation system is made up of all individuals, organizations and institutions which are linked to the way bananas are produced and marketed for export. In general, these systems include both formal and informal activities as well as public organizations and institutions, private sector players and growers (see Jansen and Vellema 2004 for more background). Changing practices which contribute to a reduction in pesticide use can be expected to involve several of these different actors. Occasionally a simple technology or training can lead to changes in practice, but more often changes, even using existing technologies not yet commonly applied, are the outcome of a complex innovation process. In the search for short term impact based on existing knowledge, opportunities can be identified in the field and on the farm, but then the relevant parties linked to bringing about the change must be identified and the steps to bring about the change visualized. This involves not only an analysis of information availability, but also a review of services and training to improve the implementation of practices as well as questions about regulations and governance. Certain applications of existing technologies or knowledge may appear unlikely due the need for change in certain parties, while other approaches can be predicted to have a more immediate impact.

To undertake such a strategic identification of actions for pesticide reduction requires a diagnostic framework for the identification of the most viable entry and leverage points. These can be visualized as the actions involving specific actors which will lead to greater changes in on-farm practice. These can be expected to vary from country to country based on the interaction between the international market chain and the particulars of the national innovation system, although much insight can be gained as well by cross-country comparisons.

***Target practices to specific agro-climates***

Bananas for export are grown under a wide variety of agroclimatic conditions (table below). These agroclimatic conditions play a fundamental role in banana crop performance and in the pest

and disease pressure and in resulting management practices. The use of pesticides in the main banana production areas follows a general pattern of more fungicides in wetter zones, and less in low rainfall areas (table below). Ramirez et al (in press) as part of the CFC-funded PRPB have correlated specific agro-climatic factors to disease pressure. The number of applications of nematicides and insecticides is much lower and less correlated with climatic conditions, although these biocides are usually more toxic. A program to reduce pesticide use through with existing knowledge should operate through pilot sites in different agroclimatic conditions, building a base of good practices applicable across all conditions as well as site-specific practices.

**Table: The number of pesticide applications in banana production in different climates**

| Country | Production area | Applications/year | | |
|---|---|---|---|---|
| | | Fungicides | Insecticides | Nematicides |
| | ***> 2500mm and < 3 dry months*** | | | |
| Belize | | 66 | 1 | 1 |
| Costa Rica | Reventazon | 56 | 1 | 3.5 |
| Costa Rica | Siquirres | 48 | 1 | 3 |
| Costa Rica | Talamanca | 39 | 1 | 2.5 |
| Panama | Changuinola | 51 | 0 | 3 |
| Colombia | Uraba | 32 | 0 | 0 |
| | ***>2500 mm and > 3 dry months*** | | | |
| Panama | Baru | 35 | 0 | 2 |
| Mexico | S Pacific | 43 | 10 | 4 |
| | ***1500-2500 mm and < 3 dry months*** | | | |
| Philippines | Davao | 35 | ? | ? |
| | ***1500-2500 mm and > 3 dry months*** | | | |
| Panama | Divala | 35 | 0 | 2 |
| Mexico | Gulf Coast | 36 | 7 | 2.5 |
| | ***900-1500 mm and > 3 dry months*** | | | |
| Colombia | Santa Marta | 35 | 0 | 0 |
| | ***< 900 mm and > 3 dry months*** | | | |
| Mexico | C Pacific | 23 | 5 | 1 |

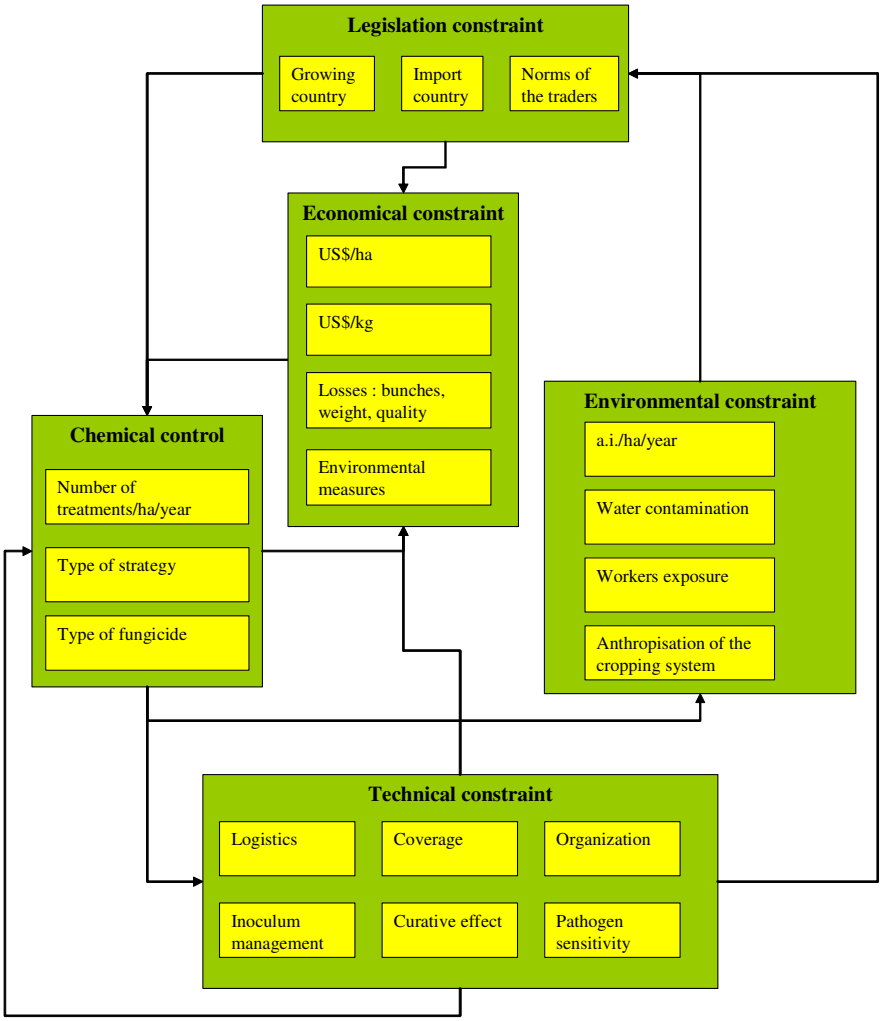
***Identify priority actions for impact through an integrated review of field, farm and landscape***

Lapeyre et al (2009) presented a framework for integrated and systematic analysis of leaf disease management in export bananas. This framework looks at the technical, economic, legislative and environmental constraints on the amount and the type of fungicide used. Specific parameters are more important under certain conditions, while other parameters operate in other conditions. This approach provides a model to be built upon to identify pesticide reduction action points. In addition to leaf disease management, other issues include nematode management, practices to manage pests and diseases of the bunch both in the field and in the packing house, plant nutrition and overall soil, root and plant health. Bioversity International carried out an innovative study of root and soil health in high input banana plantations which identified up to a dozen indicators. These indicators can then be used to orient the choice of alternative practices to improve plant, soil and root health (www.suelosbananeros.catie.ac.cr).

A protocol is envisioned to systematically compile and analyze information on existing practices, starting with the climatic and soil characteristics to estimate disease pressure and plant health. The protocol would also include races and ecotypes of pests and diseases, application technology and decision criteria, practices which affect soil, root and plant health, grower knowledge and practice and the quality, breadth and effectiveness of production services.

Through this systematic review actions can be identified as quick gains based on successful practices in other zones, minor adjustments involving simple additional information and training, major adjustments requiring changes among various parties in the banana production and market chain and changes deriving from changes in regulations and policies.

A second generation of actions can be visualized as well based on responses to the initial actions. These responses may be in the banana field itself or among the many stakeholders linked to production and marketing. Cross-country comparisons can enrich the agenda for second and eventually third generation actions.




***Add filter based on carbon footprint***

The banana is perceived as a food item with a high carbon footprint, primarily due to the distances traveled. The intensive use of fertilizers and pesticides also contributes to the total carbon footprint of the banana which reaches consumers. In this proposal we refer to the carbon footprint as an additional factor to be taken into account in the identification of strategies to reduce pesticides. Carbon tracking will be used to evaluate different approaches primarily to avoid the use of alternatives which result in a greater carbon footprint. However, the protocol to identify

the action points for pesticide reduction will also include a review of carbon costs in production and post harvest to identify additional entry and leverage points.

**Goal:** Banana-producing countries produce cleaner and greener bananas for the benefit of consumers, workers and rural inhabitants and the environment.

**Objective of proposed grant:** independent growers, public and private technical experts and international expert advisors validate strategies for reducing pesticides and carbon footprint targeted to high input banana production under specific agroclimatic zones;

**OUTPUTS:**

***Output 1:*** Integrated protocol to review current situation in pesticide and carbon use developed for use in guiding reduction strategies;

***Output 2:*** Diagnostic completed based on integrated protocol in 6 agro-climates in 4 countries for pesticide and carbon footprint reduction and accompanying changes in information, knowledge and innovation systems;

***Output 3****:* Practices for pesticide and carbon footprint reduction piloted in 6 agro-climatic zones in 4 countries;

***Output 4:*** Good practices, lessons and pitfalls reviewed and made available to countries with high input banana production for national and export markets;

**ACTIVITIES BY OUTPUTS:**

**Output 1:** ***Integrated protocol to review current situation in pesticide and carbon use;***

> ***Activity 1.1:*** steering committee identified with country representatives and expert advisors (country leaders and international technical backstopping);
>
> ***Activity 1.2:*** expert workshop to develop a.) diagnostic tools for monitoring pest management and pesticide use and its effects in the environment, on human health and on production and economic aspects and b.) protocols to identify opportunities for pesticide reduction based on agro-climate, application technology, costs and environmental and carbon footprint based on concrete and available options; (leader: CIRAD with technical experts from public and private sectors in partner countries and throughout banana export industry)
>
> ***Activity 1.3:*** expert workshop to develop protocol for the analysis of the information, knowledge support and innovation system operating around current technology use and for the identification of entry and leverage points for reducing pesticide use and its negative impact; (leader: Wageningen – Technology and Agrarian Development Group with country representatives)
>
> ***Activity 1.4:*** planning workshop to mobilize country teams to carry out 6-8 pilot zones by agro-climatic zone – opportunities for pesticide reduction and accompanying changes in information and knowledge system to achieve reduction; (leader: Bioversity with country teams)

**Output 2:** ***Identification of pesticide and carbon reduction options in 6 agro-climate zones;***

***Activity 2.1:*** Identification of and negotiation with at least 5-10 independent growers operating a block of 500-2000 hectares in each targeted agro-climatic zone to participate in diagnostic and action plan;

***Activity 2.2:*** application of field and farm protocol to characterize pesticide use/carbon footprint and identify opportunities for reduction in each pilot zone;

***Activity 2.3:*** application of review of information and knowledge system to identify entry and leverage points for pesticide and carbon footprint reduction;

***Activity 2.4:*** monitoring and interaction by expert advisors of the diagnostic studies in each pilot zone;

***Activity 2.5:*** within country workshops to present and analyze results with growers' associations, traders and exporters and technical experts (with visiting delegations from other countries).

***Activity 2.6:*** workshop with policy makers in each country to review results of pilot zones, to be trained on the alternatives to reduce pesticides and carbon footprint in high input banana production and to identify policy actions needed;

***Activity 2.7:*** workshop among all pilot zones to review results, identify major issues and develop implementation plans, including indicators for monitoring pest management and pesticide use and its effects in the environment, on human health and on production and economic aspects;

**Output 3**: ***practices piloted for pesticide and carbon reduction piloted in 6 agro-climatic zones;***

***Activity 3.1:*** planning and budgeting by task force in each pilot site for implementation of highest impact practices to reduce pesticides and carbon footprint, including needed information and knowledge system changes;

***Activity 3.2:*** training activities, reformulation of production services and policy reformulation to enable farm and field level changes;

***Activity 3.3:*** practices for pesticide and carbon footprint reduction in banana fields and packing houses in each 25% of production area in each pilot zone;

***Activity 3.4:*** monitoring of effectiveness of changes with key indicators – fruit productivity and quality, active ingredient/ha, costs of production, carbon footprint, grower readiness to expand program, perspectives of workers and rural neighbors to banana plantations (with visiting delegations from other countries and expert advisors)

***Activity 3.5:*** workshop to plan for expansion of application of practices based on grower feedback and formal monitoring;

***Activity 3.6:*** practices for pesticide and carbon footprint reduction in banana fields and packing houses in additional 50% of production area in each pilot zone;

***Activity 3.7:*** on-going of monitoring of effectiveness of changes (with visiting delegations from other countries and expert advisors);

**Output 4:** ***Good practices, lessons and pitfalls for pesticide reduction available broadly;***

***Activity 4.1:*** two workshops to review results of pilot zones (end of years 2 and 3);

***Activity 4.2:*** website and quarterly newsletter based information network easily accessible to producers and production sector, but also to public policy makers and nongovernmental organizations for the dissemination of technology and exchange of experiences;

***Activity 4.3:*** compilation of methods and results in a how-to format in three languages

***Activity 4.4:*** development of research agenda for further pesticide reduction, including promising biocontrol agents, plant nutrition and cultural practices for pesticide reduction and improved crop efficiency and productivity and leverage points for more effective generation and implementation of pesticide reduction technologies and more effective innovation systems;

***Activity 4.5:*** presentation of results in international scientific events

**(amounts in '000 U.S. Dollars)**

**Summary table: cost per output by CFC and Partner counterpart contribution**

| | CFC | Counterpart | Total | Co-funding |
|---|---|---|---|---|
| Output 1 | 150 | 100 | 250 | |
| Output 2 | 200 | 600 | 800 | |
| Output 3 | 400 | 1,500 | 1900 | |
| Output 4: | 300 | 100 | 300 | |
| Project management | 350 | - | 300 | |
| Total | 1400 | 2300 | 3700 | To be negotiated |

**TENTATIVE TIME LINE:**

| | | Year 1 | | | | Year 2 | | | | Year 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Output 1: integrated protocol to review current situation in pesticide and carbon use – field, farm and support system** | | | | | | | | | | | | | |
| 1 | Steering committee organized | | | | | | | | | | | | |
| 2 | Expert workshop diagnostic tools for field farm level reduction of pesticides and carbon footprint | | | | | | | | | | | | |
| 3 | Expert workshop on characterization of information and knowledge support system | | | | | | | | | | | | |
| 4 | Planning workshop on pilot zones to validate protocols and characterization methods | | | | | | | | | | | | |
| **Output 2: : Identification of pesticide and carbon reduction options in 6 agro-climate zones** | | | | | | | | | | | | | |
| 1 | ID and negotiation 5-10 growers with 500-2000 has | | | | | | | | | | | | |
| 2 | Field and farm diagnostic in each pilot zone | | | | | | | | | | | | |
| 3 | Knowledge and information support system characterization in each pilot zone | | | | | | | | | | | | |
| 4 | Monitoring and interaction by expert advisors | | | | | | | | | | | | |
| 5 | Country workshop to analyze results | | | | | | | | | | | | |
| 6 | Country workshops to review results with policy makers | | | | | | | | | | | | |
| 7 | Workshop with all pilot zones to review results and plan for implementation of high impact practices | | | | | | | | | | | | |
| **Output 3: practices for pesticide and carbon footprint reduction piloted in 6-8 zones in 4 countries** | | | | | | | | | | | | | |
| 1 | Planning by task force in each site for implementation | | | | | | | | | | | | |
| 2 | Training, services and policies to enable use of practices | | | | | | | | | | | | |
| 3 | Use of practices in 25% production area in each zone | | | | | | | | | | | | |
| 4 | Monitoring of effectiveness of practices | | | | | | | | | | | | |
| 5 | Review of monitoring feedback and plan for expansion on larger area | | | | | | | | | | | | |
| 6 | Use of practices in additional 50% of production area in each pilot zone | | | | | | | | | | | | |
| 7 | Monitoring of effectiveness | | | | | | | | | | | | |
| **Output 4: practices, lessons and pitfalls reviewed and made available to others** | | | | | | | | | | | | | |
| 1 | Two workshops to review results | | | | | | | | | | | | |
| 2 | Website and newsletter on advances | | | | | | | | | | | | |
| 3 | Compilation of results/experiences in how-to format | | | | | | | | | | | | |
| 4 | Identification of research agenda based on results | | | | | | | | | | | | |
| 5 | Presentation of results in international congress | | | | | | | | | | | | |

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