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NEEDS FOR NATIONAL AND INTERNATIONAL COLLABORATION IN TRAINING ON FUMIGATION AND CONSERVATION OF STORED PRODUCTS IN CENTRAL AFRICA.

(THE CASE OF CAMEROON)

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SUMMARY

The post harvest losses of the different food crops that comprise the sources of food and provide food security to the different population strata in Cameroon remain a limiting factor that must be solved through suitable conservation treatments and storage techniques.

To date, the fumigation technology is unique in its efficiency, applicability and wide spectrum of use. This technology can be applied to many situations where other techniques are non-operable, ineffective or are simply not feasible. The promotion and development of fumigation should henceforth be given high priority.

Consequently, the need for national and international collaboration for the training of personnel in the fumigation domain and especially in Cameroon cannot be too highly stressed. This training concept should embrace two types of personnel: the real actors on-site or in the field - those dealing with the different harvested crops or involved in food processing (the practitioners) - and their instructors. This way guarantees the perpetuation of this technology locally and its dissemination from the base upwards.

To reach these goals, people in charge of the agricultural sector of food security in the country should be fully aware of the benefits to be obtained from this technology and the ways (where, when and how) of tackling the problem of implementing fumigation training. Up till now, this does not seem to be the case.

It is true however that since Mouen's paper on "The needs for training on fumigation of stored products In Central Africa" at the CAF 2000 conference in Fresno, California, international partners have shown up and researchers have taken the relay. Some new training modules have even been registered. Thus at the 8th international conference of stored Products at York UK 2002, training modules based on CD and video tapes employing the latest techniques in communication and information were

produced. According to their promoters, these techniques could be widely used in the 21st century.

Post harvest losses are still at around 30% for fruits and vegetables; 25-30% for tubers and 15-20% for cereals over the last two years in Cameroon and the author believes that these losses are only going to increase with time if nothing is done, given the degree of poverty and the relatively low technological environment in Cameroon and other countries of Central Africa.

To offset this potential disaster, she strongly advises that it be considered to implement research programs that:

will identify cheap and natural insecticide powders to be used carefully by peasants and farmers

will isolate the active principles of local botanical insecticides and study the possibility of their insertion and integration into fumigation procedures

In the following, the author presents the anticipated results and the related training program, summarized as follows: Fumigants principles – methods of detection and analysis of wastes – properties of fumigants – the biology, nature and structure of plants and food produce to undergo fumigation – management and conservation of seeds – handling and storage – factors of biological deterioration and their control – transformation and quality control – economy and management – information and communication.

Finally, she proposes the creation of an international organization to promote training for fumigation and research into natural fumigants.

CONTEXT AND JUSTIFICATION

Post-harvest losses of various yield crops in our country remain a serious problem that needs to be solved through appropriate conservation, storage and processing techniques in order to minimise the losses occurring at each stage in the food-chain and related to insect infestations and others causes.

The actual norms and restrictions concerning the use of chemical insecticides used in some operational phases to combat the devastations of insects, require that the officials and all those in charge of such operations and whose roles are to undertake and control the treatments, be able to master the many factors and parameters involved that were neglected in the past.

They should have a thorough knowledge of the insect pests concerned, of the crops to be treated, of the dangers and risks potentially encountered by the use of fumigants,

and the security measures that should be taken throughout. They should also be aware of the official national and international regulations related to the use of these products. Furthermore, knowledge of the management and the conservation of stocks is also very important.

It has been demonstrated that the fumigation of foodstuffs or stored crops, is one of the unavoidable technologies which up to now, due to its characteristic operational methods seems to be the one successful method in many situations where others techniques are not possible or convenient, and will still be used for a long time in the future. Consequently, it is necessary for all professionals and officials in charge of food control at all phases of the food-chain leading to human consumption to master this technique..

The training needs in the domain of phytosanitary treatments in general and fumigation in particular are felt even more acutely now than in the past, since the country must move from a subsistence agriculture to an intensive agriculture to compete in the regional, national, and international markets. Furthermore these sanitary treatments are also needed to conserve the important food stocks required to promote and maintain food security in the country.

OBJECTIVES:

Global objectives:

The main objectives of the training program are to assure in the short term:

- The training of those who will train the users of the technology
- The training of the users

The first group of trainers will be able to carry out on-the-spot training of other Camerounians, and those from other countries interested in the conservation of produce after harvest. This will be of high priority knowing that our country may have very important food stocks in the future.

Specific objectives:

In the short and medium terms, there will surely be a need to foster research programs that will include:

1. the identification of natural insecticides existing in the country and used traditionally by local farmers
2. the isolation of the active principles of local insecticides; this could lead to studies on the possibility of using or integrating them into fumigation techniques, with the help of research workers in other countries that have already been successful in such enterprises, notably:

* Shuit H.Ho of the University of Singapore has found that some essential oils taken from well known spices such as garlic can constitute good natural insecticides for the protection of stored food stuffs.

* Ofuya of Nigeria has found that the smoke released from the grains of *Engenia aromatica* immobilises *Callosobruchus maculatus* (F) adults within 24 hours and kills them in 48 hours as well as the eggs and all other larva stages.

* Shukla, Shahi, Adikshi and Saksena have found in India, that the essential oils of some plants and particularly of *Cymbopogon flexnorus* can effectively combat fungi and insects in stored foodstuffs.

* Ketoh, Glitho, and Koumaglo of the Faculty of Sciences at the University of Lome, Togo and Auger of the Institute of Research on the Biology of Insects and Huignard of the Faculty of Sciences and Techniques at the University of Tours in France have shown that nièbè seeds can be protected by spraying essential oils of some poaceae such as *Cymbopogon nardus* and *Cymbopogon schoenanthus* while maintaining their germination power.

POSSIBILITIES OF INTERNATIONAL COLLABORATION

Following a previous paper presented by this author at the CAF Conference of 2000 on “The Needs For Training In Fumigation of Stored Products In Central Africa”, several researchers have expressed their interest in furthering the implementation of fumigation training and teaching in Central Africa in particular and in developing countries in general.

Dr Boxal of the Institute of Natural Resources of England had manifested his interest in helping us to implement such a training scheme and program.

Also J. Van Graver of Australia (2002) stated that training in fumigation in the 21st century will be possible and disseminated via new technologies of training, information and communication: CDs and video tapes for the demonstration of fumigation techniques and improvement in the use of fumigants are already available.

This new system will be advantageous for those users with a minimum of knowledge in the subject and will address the following aspects:

- A better use of the existing techniques
- An improvement in sustainability of techniques
- Reductions of post – harvest losses and management of users
- An improvement of access to information
- A dissemination of available techniques

In this way it will be possible to develop and undertake training programs that could help to reduce the present levels of post-harvest losses in Central Africa. as described previously

However, the danger is that these losses may increase in coming years unless the authorities and ministerial departments at the national level promote this program. In Cameroon these are The Ministries of Agriculture and of Sciences And Technical Research (MINAGRI and MINREST). The importance of such actions must not be underestimated.

Proposals since January 2001 to hold seminars on fumigation training and the preservation of stored products, by the independent group (COSADER), association of NGO's, for food security and the rural development of Cameroon must be addressed by the national authorities while encouragement for cooperation has already been provided by scientists of the NRI of the UK.

Lack of affirmative action only serves to discourage the NGO's which have neither the financial means, nor the authority for the realisation of such an important program.

The author wishes to make use of this platform to send a resounding call to all concerned parties so that together we will act to minimise these post-harvest losses that are continuing to increase from year to year in this poverty stricken country where food security just remains a dream.

ANTICIPATED RESULTS

Those who will be selected for this training will gain knowledge on the use of fumigants:

- * Principle of fumigation
- * The importance of fumigants
- * Factors that condition the use of fumigants
- * Methods of dosage of fumigants in the field
- * The mastery of precautionary measures, safety and protective mechanisms
- * The biology and the chemical composition of plants and food crops to be treated
- * The biology, the biological cycle and the identification of insects, rodents and other harmful organisms
- * The management of stored products.
- * Biodegradable factors and their monitoring.
- * Crops and food handling and storage.
- * The monitoring of all biological deterioration factors.
- * Transformation and quality control.
- * Economy and stock management.
- * Information transfer and communication.

**TRAINING PROGRAM ON FUMIGATION, CONSERVATION AND THE
MANAGEMENT OF POST HARVEST PRODUCTS AND CROPS**

The fumigating products (fumigants) principles

- * Definition of fumigants
- * Choice of fumigating products
- * Dosage and concentration of residues in the foods
- * Toxicity to insects

Residues in foods: method of detection and analysis

- * Chemical method
- * Instrument analysis
- * Type of equipments to be used in the field and in the laboratory

Security measures and protection mechanisms

- * Security threshold values.
- * General precautionary measures in the handling of fumigating products throughout the application process.

Fumigating products (fumigants) characteristics

- * General characteristics
- * Toxicity to insects
- * Action on seeds; bulbs; growing and dormant plants, vegetable products, fresh fruits, vegetables, roots, and cereal products
- * Action on animal products
- * Residues
- * Gas detection, method of application, sealing and ventilation

Biology and structure of plants and foods to be treated

Since the treatment is related to the chemical composition of the food to be fumigated or preserved it is very important to know and master the biological structure of the food products.

Management and preservation of seeds

The program addresses the principles and the ways to manage cereals, vegetable oils and seeds and other food crops at all post harvest levels and systems appropriate to tropical and subtropical climates.

The participants will gain the know-how to evaluate the management systems of post harvest produce and crops, to devise and introduce improvements and to communicate effectively with the persons in charge of program policies. They will also learn to communicate and work with other colleagues in multidisciplinary teams.

Handling and storage

- * Physical factors

- * Storage structures
- * Conditioning, handling and processing equipments
- * Packaging or wrapping.

Factors of biological deterioration and their control

- * Destruction of stored products by insects
- * Management of contamination due to insects
- * Rodent control
- * Microbiological deterioration

Transformation and quality control

- * Quality of cereal grains or other harvested crops
- * Gauging and quality control
- * Evaluation of post harvest losses
- * Processing of grain for human consumption
- * Processing of grain for animal consumption

Economy and management

- * Cereals systems and policies
- * Economy and logistics
- * Management and throughput operations
- * Development

Information transfer and communication :

- * Communication techniques
- * Methods of extension work
- * Information on new technologies

CONCLUSION

The implementation of the afore- described research programs and training workshops on the fumigation of stored crops and food stuffs could lead to the production of natural, cheap and locally available insecticides exploitable at the national and even international level, especially at this moment when much is being said about population health problems and deterioration of the environment due to chemicals.

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