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COMMITTEE ON COMMODITY PROBLEMS

INTERGOVERNMENTAL GROUP ON TEA

NINETEENTH SESSION

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PROJECT PROPOSAL FOR SUBMISSION TO THE COMMON FUND FOR COMMODITIES: IMPROVEMENT OF AGROCHEMICAL USING TECHNOLOGY FOR SMALLHOLDERS TO BETTER QUALITY AND SUSTAINABLE PRODUCTION OF TEA

I. Executive Summary

Goal and objectives: the project aims to help small holders to proper use agrochemicals to increase yield and improve quality of tea while reduce the cost of production, protect the environment and sustainable production of tea. It would include to adapt integrated nutrient management and integrated pest and disease management special for small holders to use the agrochemicals, and set up Farmers Field Schools (FFS) and Participatory Technology Development (PTD) programme as a training and technology development methodologies, and extend these technologies, techniques and methodologies to small holders to improve their agrochemical application levels.

Intervention strategies: three components are planned. (1) Research and development focus on the speciality technologies and techniques of agrochemical application for small holders. (2) Set up Farmers Field School and Participatory Technology Development programme in a village and small holder association. (3) Dissemination and training including booklet publication, FFS, TDP and other means will be carried out to extend the technology and techniques of agrochemical application to small holders.

Expected output: the suitable technologies and techniques developed for small holders to use agrochemicals; the small holders use these technologies and techniques could

increase profit of 10%; two FFS were established for the training of small holders□50 trainers and 250 Small holders will be trained.

Implementation agencies and collaborators: Tea Research Institute of the Chinese Academy of Agricultural Sciences (TRI CAAS) is an implementing and executive agency. Collaborators are Wuyi Tea Extension Centre (WTEC) and Anji Agriculture Bureau (AAB), and the FAO Intergovernmental Group on Tea as the supervision body.

Total project budget: The total budget will be 151,000 USD, from which USD120,000 USD sought from CFC as grant and USD31,000 USD financed by TRI and collaborators as counterpart contribution.

Duration: Two years from 2011 to 2012.

1. The Project Background

Tea is originated from China. China is the biggest country to produce tea. In 2008 the area under tea production was 1.72 million ha with tea production of 1.2 million ton. The total production value was 33 billion RMB (Chinese yuan). 297 thousand tons of tea was exported with the exporting value of 682 million US dollars. The majority of tea was produced by small holders. It was estimated that about 20 million small holders involved in tea production in China. In some tea specialized towns or villages, 80% of farmer's income is from tea production. Tea is the main source of income and employment and plays a vital role in poverty alleviation and livelihood improvement of farmers, especially small holders.

To improve the production and quality of tea, farmers use large amount of agrochemicals, including chemical fertilizers and pesticides. A survey conducted by Tea Research Institute of the Chinese Academy of Agricultural Sciences shows that the average of 703.2 kg/ha of NPK was applied in typical producing counties, among of them, 553.4 kg was N, P (P_2O_5) and K (K_2O) was only 76.6 and 73.2 kg/ha, respectively. The N applied was more and the ratio of NPK (1：0.14：0.13) was far behind the recommended ratio of 450kg/ha and 1:0.25-0.5:0.25-0.5, respectively. The survey also shows that 93.5% of the NPK comes from chemical fertilizers. One extreme case was that a small holder annually applied 250 kg compound fertilizer with total NPK 45%, 200 kg urea, 500 kg commercial organic fertilizer and 4000 kg compost in only 0.087 ha of tea field. Pesticide application was another major problem in tea production. Tea farmers, especially small holders did not use the pesticides in a rational way, overdose of pesticides, the pesticides used did not against the target pests, inappropriate application time and method happened frequently in tea farmers, especially small holders.

The inappropriate application of agrochemicals resulted in many problems including the cost of production, food safety, environment protection and agriculture sustainability. The cost of agrochemicals accounts for 40% of the total production cost, just next to the labour cost. The pesticide residue is another issue in terms of the food safety. It is one of the main problems facing the tea export, especially to the premium market, such as EU and Japan. Large amount of the agrochemicals also come into the environment: soil, water and even air. It was estimated that 70% of N and 90% of pesticides applied go to the environment. For example, in a field with N application rate of 900 and 500 kg/ha, the N leached as NO_3^- was 457 and 155 kg/ha, respectively in the first year of the N application, resulted in NO_3^- -N concentration often in excess of 50 mg/kg in nearby surface and ground water. The N_2O, an important green house gas emitted from tea fields was about 30 times higher than that in other crop fields. Soil compact, over acidification, low microorganism and imbalance of nutrients was often happened due to large amount of chemical fertilizers application. The excessive acidic soils even increase the bioavailability of heavy metal, such as Pb and Cd by tea plants, eventually increase heavy metal concentrations in made teas. The applicator safety and "3 Rs" (Residue, Resistance and Resurgence) problems also take place due to the over use of pesticides. Therefore, it is necessary to improve the efficiency of agrochemical applications by appropriate use of fertilizers, reducing pesticide use and minimizing environmental contamination.

Some technologies and techniques for the use of agrochemicals were developed in the last few years, such as the integrated nutrient management and integrated pest management. However, due to extensive area under tea production with different soils, climate and ecological systems, these technologies and techniques still needs to be further developed and adapted to the local conditions. And these technologies and techniques need to be simplified for easy use for small holders.

Extension work is another key factor to improve the technologies and techniques of agrochemicals in small holders. Training is conducted sometimes for both large companies and small holders. However, we adopted same methodology of training, mainly presentation or lectures by experts and sometime including field visits. The results is not good especially for

small holders since they are normally lack of education and not have a comprehensive understanding for what they have listened to in these training. Therefore, special methodologies of training for small holders should be developed.

2. Project Rationale and Objectives

The rationale for a project to support the proper use of agrochemicals in tea fields is dependent on two mutually reinforcing factors that have influenced the behavior of the small holders. On the demand side, food safety, such as heavy metals and pesticide residue in teas is strongly concerned by consumers. Regulations on the food safety are getting strict steadily. The made tea with excessive heavy metal or pesticide residue cannot access to the market. On the supply side, farmers not only concerned the food safety, but also the efficiency of the application and the cost. The cost of agrochemicals is becoming one of major issues to make profit in tea production. Farmers expect the effective technologies and techniques to fertile the soils and protect their plants while reduce the cost of production and protect the environment and the agriculture sustainability as well. However, three critical elements have constrained the proper use of agrochemicals, especially for small holders. One is the technologies and techniques for proper use of agrochemicals in different soils, climate and ecological systems still need to be developed and adapted. The current advanced technologies should be simplified for easy using. The second is the current methodologies to extend these technologies to small holders are not effective. And the third is the training of small holders is not extensively conducted.

The goal of the project is to improve technologies and techniques for the agrochemical application in tea fields, and to benefit small holders through the reduction of production cost and sustainable production. The specific objectives are to:

i) Further develop and identify the technology, techniques and systems for appropriate use of agrochemicals to increase the production and improve quality of tea;
ii) Reducing cost of production by increasing efficiency of fertilizers and pesticides;
iii) Protect the environment and sustainable production of tea;
iv) Develop appropriate methodologies for tea small holder training;
v) More small holders benefited from the extensive training through the project.

3. The Scope of Activities and Targets

The project scope of activities is to develop appropriate technologies and techniques for the use of agrochemicals, including chemical fertilizers and pesticides in tea fields to ensure the food safety, environment protection and agriculture sustainability, and to develop suitable methodologies for the training of small holders. Farmer Field School (FFS) and Participatory Technology Development (PTD) will be adopted to develop these methodologies. Various of extension work will be conducted to small holders.

The targets of the project are to proper use of agrochemicals in tea fields, especially by the small holders with tea as their main income and employment. There are three successful indicators: (1) the integrated nutrient and pest management adapted to the local conditions, which could increase the production and improve the quality of tea while reduce the cost of production and protect the environment. (2) The financial benefit increase 10% for the small holder using the new techniques compared to other small holders. (3) Two FFSs for the training of small holders in different locations will be established. And (4) Fifty trainers and 250 small holders will be trained for proper application of agrochemicals.

The focus of the project is to develop technology and generate information for the proper use of agrochemicals and the methodologies of training for the small holders. So the results will be benefited by all the small holders, especially directly participants in the model farms, FFS and PTD programs, and other workshops and extension works. Additionally, the development of technology will benefit other tea producers as well. The project would also contribute to the

environment protection and sustainability of tea production by reducing side effect of agrochemical application.

4. Implementation Plan

4.1 PROJECT COMPONENTS

The project will have three components, including the improvement of integrated nutrient and pest management adapted to the local conditions, the development of methodologies of training for small holders and the extension of these technologies and methodologies to the small holders.

Component 1: Research and development on improvement of the agrochemical application technology and techniques for small holders

The existed integrated nutrient management and integrated pest and disease management will be used as a basis of the agrochemical application technology development. These technologies and techniques will be adapted to the local conditions, especially the soils, climate and ecological systems and simplified for small holders. Model farms in different situations, such as low land and mountains, heavy chemical application farms and low production fields will be set up for this purpose. The following activities will be conducted in the model farms.

(1) **Quick nutrient diagnosis**: research on quick and non-destructive measurement such as using fertilizer window and plant visible symptoms analysis will be conducted for the recommendation of fertilizer application.

(2) **Fertilizer application improvement**: based on the soil and nutrient diagnosis, what fertilizers, how many quantities, when and where to be placed, how to apply will be further developed specially for the small holders.

(3) **Pesticide application improvement:** the chemical pesticides with high efficiency and low toxicity, biopesticides, and agronomic and mechanical measures will be selected and further developed for the key pests and diseases management. These methods will specially design for the use of small holders.

Component 2: Training methodology development for small holders

The current “spoon feeding” training is not suitable for the small holders. We will focus on the experiential and participatory training for the methodology development. The following activities will be included:

(1) **Development of Farmer Field School (FFS):** the training approach of Farmer Field School will be studied for the adoption and modification in terms of the agrochemical application and tea production. FFS is a group based learning process. During the FFS, small holders will carry out experiential learning activities that helped them understand the growth and development of tea plant and the ecology system of their tea fields. These activities involve simple experiments, regular field observations and group analysis. The knowledge gained from these activities enables participants to make their own locally-specific decisions about agrochemical management practices. Two farmer field schools will be set up with cooperative organizations.

(2) **Development of Participatory Technology Development (PTD):** PDT is an approach of learning and innovation. It involves collaboration between researchers and small holders in the analysis of agricultural problems and testing of alternative farming practice. PDT will be adopted and modified for the learning of rational application of agrochemicals.

Component 3: Dissemination and training

The technology, techniques and methodologies developed in this project with other existing technologies will be integrated and extended to not only the farmers participated in the project, but also other small holders to improve their agrochemical application technologies. One booklet, two farmer field schools will be set up. One training for trainers and 5 trainings for small holders adopted FFS or PTD approach with total 300 participants is planned. The following measures will be included.

(1) Booklet compiling and publication: a booklet with easy understand words and practical measures of proper use of agrochemicals will be published and distributed to trainers and small holders.

(2) Training of trainers: the training of trainers using the FFS approach will be conducted firstly before the training to others. The training methodology to small holders and technologies will be included in the training**.**

(3) Training of small holders: Two FFTs cooperated with Wuyi Tea Extension Centre (WTEC) and Anji Agriculture Bureau (AAB) will be set up for the small holder training.

(4) Other dissemination activities: a PTD program will be set up in a model farm for the training and innovation of technologies. Workshops and seminars in provincial and county levels with some specific target, such as agrochemical sellers, keepers and users will be conducted. Regularly on farm visit, information exchange between researcher, extension workers and farmers by email and phone will be included. The developed new products such as biofertilizers and biopesticides will be disseminated with promotion price.

During the training, the gender issue will be considered. The female will be encouraged to participate.

4.2 PARTIES INVOLVED AND THEIR RESPONSIBILITY

Tea Research Institute, Chinese Academy of Agricultural Sciences (TRI CAAS): It is the only national tea research institute, located in Hangzhou, the capital of Zhejiang province. TRI CAAS owns experts and expertise in all aspect of the tea industry. It will be the leading organization, responsible for co-ordination of all component of the project. It will be responsible for research and evaluation on improvement of the agrochemical application technology and techniques for small holder, for setting up the farmer field schools, co-ordinating the training and extension work. TRI CAAS will organize systematic quarterly reviews of project implementation, identify and resolve problems and submit annual reports to FAO and CFC.

Wuyi Tea Extension Centre (WTEC): It is a county level extension center located in southwest of Zhejiang province. Most of tea gardens are located in the mountains. Farmers are lack of knowledge and information. WTEC will set up a Farmer Field School cooperated with TRI CAAS in a typical village in the county and conduct training for small holders

Anji Agricultural Bureau (AAB): It is one of the counties producing one of the most famous Chinese premium teas, namely Anjibai Tea in China. Normally large amount of agrochemicals applied in the tea fields. It is located in the north of Zhejiang province. It will set up a Farmer Field School in a small holder association and carry out the training for small holders.

4.3 TIME FRAME

The project will be finished within two years from 2011 to 2012. The schedule for the activities to be implemented is listed on the following table 1.

Table 1. The time frame for different activities of the project

Component and Activity	2011				2012			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
1 Research on agrochemical using technology and techniques for small holders								
1.1 Quick nutrient diagnosis	√	√	√	√	√	√	√	√
1.2 Fertilizer application improvement	√	√	√	√	√	√	√	√
1.3 Pesticide application improvement	√	√	√	√	√	√	√	√
2 Training methodology development for small holders								
2.1 Farmer Field Schools set up	√	√						
2.2 Farmer Participatory Technology Development	√	√						
3 Dissemination and training								
3.1 Compile a training booklet	√	√						
3.2 Training of trainers		√						
3.3 Training of small holders			√		√	√	√	√
3.4 Other dissemination activities	√	√	√	√	√	√	√	√

5. Risk assessment and assumption

The project encompasses three risk categories related to project management, technical efficiency and farmers' willingness to participate. The first and second risks are minimal since TRI CAAS has a long track record of implementing a variety of research and extension programmes indicating effective project implementation and management. The situation with respect to the small holder participation will not the problem as well since they are concerned the cost of production, food quality and environment protection.

There are five assumptions for successful implementation of the project. The technology and techniques developed are efficient and adaptable in different geographical sites for small holders to appropriate use the agrochemicals. The model farms are successful increase the efficiency of agrochemicals and reduce their cost of production. The methodologies of SSF and PTD for the training of small holders are welcome by them. Financing from all sources is made on a timely basis in line with proposed activities and annual Work Plan/Budget.

6. Project Cost and Financing

The total project cost is estimated at 1,030,000 RMB, equivalent to USD151,000 USD according to the current change rate of 7.82 RMB to 1 USD. The component 1 for research on agrochemical application technology and techniques for small holders will be cost 320,000 yuan. The component 2 for the training methodology development, including set up of Farmer Field Schools and Farmer Participatory Technology Development will be cost 210,000 RMB. The component 3 for the dissemination and training of trainers and small holders will be cost 400,000 RMB. And the organization and management cost about 100,000 RMB. The table 2 shows the details of the cost in RMB and USD.

The total budget for this project is RMB 1,030,000 RMB, or about USD151,000 USD. Financing sought from CFC is USD120,000 USD as grant. And TRI and its collaborators will contribute totally USD31,000 USD in kind.

Table 2. The cost estimated for different activities of the project

Component and Activity	Cost	
	Thousand Yuan	Thousand USD
1 Research on agrochemical using technology and techniques for small holders		
1.1 Quick nutrient diagnosis	120	17.6
1.2 Fertilizer application improvement	100	14.7
1.3 Pesticide application improvement	100	14.7
2 Training methodology development for small holders		
2.1 Farmer Field Schools set up	120	17.6
2.2 Farmer Participatory Technology Development	90	13.2
3 Dissemination and training		
3.1 Compile a training booklet	50	7.3
3.2 Training of trainers	50	7.3
3.3 Training of small holders	250	36.7
3.4 Other dissemination activities	50	7.3
4. Organization and management	100	14.7
Total	1030	151.0