CAMBODIAN AGRICULTURAL RESEARCH FUND (CARF) PROJECTS

Round 4

Project ID: APHEDA 73 Experimentation on high nutrition, low cost, fish foods for domestic freshwater pond fish farming

Lead Organisation: Union Aid Abroad – Australian People for Health, Education and Development Abroad (APHEDA)

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Collaborating Institutions:

- Department of Agriculture, Forestry and Fisheries, Chhouk Fisheries Station, Kampot Province
- Faculty of Fisheries, Royal University of Agriculture

Project Budget: USD$18,890.00

Project Duration: June 2005 – May 2007

Project Overview:

This project aims to formulate a low-cost, highly nutritious option for fish feed for small-scale freshwater pond aquaculture. The food sources tested include dried and ground *Leucaena leucocephala* and earthworms, which would be primarily generated on-farm and enable poor rural fish farmers to improve their returns from fish farming. *Leucaena leucocephala* was developed in Australia as a high protein cattle feed, and previous research has indicated it has potential as a fish food. As a fish food (for Indian carp and potentially silver barb fish) it would be almost cost neutral, as the trees are easily grown from seed or cuttings and are very fast growing. Earthworms are currently used as chicken feed, and they are expected to be highly nutritious as fish feed, although they will incur a small cost to farmers. The project will compare the growth of two-month old fingerlings of three fish species over a six-month period. *Leucaena leucocephala* and earthworms proved successful as fish feed in the early trials, and local workshops are now being held for farmers on growing and raising the food sources and feed formulation. An issue under examination is the materials and labour requirements for raising the earthworms.

Project ID: CARDI 83 Banana improvement for Cambodian farmers

Lead Organisation: Cambodian Agricultural Research and Development Institute (CARDI)

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Collaborating Institutions:

- International Network for Improvement for Banana and Plantain (INIBAP)

Project Budget: USD$15,000.00

Project Duration: June 2005 – June 2008

Project Overview:

Banana plants are native to Cambodia and they play an important role in the Cambodian diet, providing calories, minerals and protein. Wild banana species are found throughout Cambodia and farmers regularly cultivate new varieties. This has led to high genetic diversity amongst cultivated and wild species across the country. Until 2002, very little research has been done on banana improvement, which has now been introduced into the CARDI plant breeding program. The project aims to continue collection and conservation of cultivated and wild banana species, and to introduce good cultivars identified by experiments proposed in this document to farmers.

Project ID: CARDI 84 Identification of banana cultural practices, cultivation management, prospective for production improvement and growers' income

Lead Organisation: Cambodian Agricultural Research and Development Institute (CARDI)

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Collaborating Institutions:

- NSW Department of Primary Industries, Australia

Project Budget: USD$19,978.00

Project Duration: June 2005 – May 2007

Project Overview:

Bananas play an important nutritional and economic role in the Cambodian economy, particularly for rural and low income households. The majority of farmers are primarily rice growers, however, alternate field and fruit crops, particularly banana, provide food for household consumption and market sale, depending on the scale of the production. The scale of cultivation ranks from a couple of clusters, mainly in small households in the rainfed lowlands, to commercial cultivation, mainly in the upland areas and medium farms along the Mekong River bank regions with high soil fertility. One of the constraints for farmers is finding suitable varieties of banana to grow, particularly in the rainfed lowland.

This project aims to investigate the practices of banana cultivation and production, in order to assess the returns from banana production and local marketing of banana fruits. This will involve investigating the use of different cultural practices for the crop, farmers' methods for pre-harvest and post harvest management, and an economic analysis of banana production and marketing process of the produce. This will contribute to developing suitable methodologies and strategies for managing the banana crop. This project also aims to identify banana varieties which are resistant and susceptible to diseases, in particular Fusarium wilt.

Project ID: CARDI 87 Trends in productivity and nutrient dynamics under improved soil nutrient management techniques for rice in the rainfed lowlands of Cambodia

Lead Organisation: Cambodian Agricultural Research and Development Institute (CARDI)

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Collaborating Institutions:

- Murdoch University, Western Australia
- Department of Agriculture, Western Australia

Project Budget: USD$29,997.00

Project Duration: June 2005 – June 2008

Project Overview:

Sandy soils dominate the Cambodian lowlands, and represent approximately 50% of the total Cambodian rice production areas. Plant growth and yield in the lowlands is relatively low, primarily because it is limited by poor soil fertility and fluctuating soil water regimes (rainfed). This makes the soil difficult to manage for crop cultivation, particularly with relation to nutrient retention and organic matter. A better understanding of the soil-nutrient dynamics and crop nutrient demand would improve nutrient efficiency to establish sustainable soil management techniques and increase farming profit. This research will examine the productivity trends (impacts on rice grain yields and quality) of sandy soils under different nutrient management systems, including organic, inorganic and a combination, to determine the most appropriate management strategy for local farmers. The overall outcomes of this project will include improved soil-nutrient management strategies that benefit farmers.

Project ID: CARDI 88 Improvement of watermelon for Cambodian farmers

Lead Organisation: Cambodian Agriculture Research and Development Institute (CARDI)

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Collaborating Institutions:

- Department of Agriculture, Forestry and Fisheries, Siem Reap Province

Project Budget: USD$29,848.00

Project Duration: June 2005 – June 2008

Project Overview:

Watermelon (*Citrullus lanatus*) is an important crop for Cambodian farmers. It is grown as secondary crop before and after rice cultivation, in the dry season and early wet season, across the country. Watermelon plays a vital role in crop diversification in Cambodia, especially in rainfed conditions. The objective of this research is to diversify cropping system in post and pre rice cultivation for farmers. The aim is to select new watermelon varieties with high yield and market quality, to facilitate adoption of new techniques for growing the crop, and encourage the availability of good quality seed.

Project ID: CARDI 89 Post-harvest losses reduction of rice damage due to rat and insect pests in Cambodian environment (PRODUCE)

Lead Organisation: Cambodian Agricultural Research and Development Institute (CARDI)

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Collaborating Institutions:

- CSIRO Sustainable Ecosystems
- Agriculture Fisheries and Forestry Department, Kandal Province
- Agricultural Extension Office; Kg Cham Province, Kg Chhnang Province, Takeo Province, and Prey Veng Province.

Project Budget: USD$29,892.00

Project Duration: June 2005 – June 2008

Project Overview:

Many rural households in Cambodia face annual food shortages. One of the major causes of this is rice losses during storage through rat and insect infestation. The aim of this project is to assess and evaluate the level of damage from rat and insect pests in rice storage facilities. This information will provide farmers with guidelines to manage rice storage facilities and contribute to improving rice store conditions and reduce pesticide use. This research will reduce poverty in the region, through improved rice storage facilities which will increase farmer income and health. Storing rice in an appropriate facility will also reduce pesticide application and consequently, the risk of pesticide contamination to consumers.

Project ID: CARDI 90 Improving rice grain quality by controlled drying paddy

Lead Organisation: Cambodian Agricultural Research and Development Institute (CARDI)

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Collaborating Institutions:

- GTZ Agronomist Rural Development Project, Kampong Thom and Kampot
- University of Queensland

Project Budget: USD$19,932.00

Project Duration: June 2005 – June 2007

Project Overview:

Rice is a staple food crop and major source of income for a large proportion of families in Cambodia. A recent study undertaken by the Agricultural Engineering Program of the Cambodian Agricultural Research and Development Institute with the CARF funding has shown that more than a third of rice grain is lost during harvesting and post harvest handling and processing. This study also identified a lack of an overall quality monitoring of rice by farmers and millers as a contributing factor for post-harvest losses.

The aim of this research project is to minimize post-harvest rice grain losses and improve rice grain quality with appropriate post-harvest technologies, which will increase the income of farmers and village millers. This will be done by demonstrating to farmers and millers the various factors responsible for milling losses and degradation of rice quality, and by offering an alternative: purchasing a communally owned mechanical drier to increase grain quality. This type of drier has proved successful in Vietnam and an initial trial will demonstrate this to Cambodian farmers. One dryer will be installed in each province and training workshops for farmers, millers, district agricultural officers and NGO representatives will be organised.

Project ID: DAALI 78 Study on the infestation of Coconut beetle and its biological control

Lead Organisation: Department of Agronomy and Agricultural Land Improvement (DAALI), Ministry of Agriculture Fisheries and Forestry (MAFF)

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Collaborating Institutions:

- FAO Cambodian National Integrated Pest Management Program, (MAFF)
- Provincial Department of Agriculture, Fisheries and Forestry (Kandal, Kampot, Kg Cham, Mondulkiri)
- Nong Lam University of Agriculture, Ho Chi Minh City, Vietnam

Project Budget: USD$19,700.00

Project Duration: June 2005 – May 2008

Project Overview:

The Coconut Hispine beetle (*Brontispa longissima*) has the potential to be one of the most devastating coconut pests. Both larvae and adults feed on tissues of developing, unopened leaves and this can cause significant production losses and tree death. The beetle first appeared in Cambodia in January 2003 and its appearance has been traced back to Vietnam. In provinces near the Vietnam-Cambodia border, up to 15 % of cocnut palms were killed by the pest.

The use of chemical control measures has proven inadequate and infective to control beetle spread. In addition to prohibitive costs, the insecticides must be introduced directly into the crown of the tree which subjects those applying insecticides to particularly high risk of both inhalation and dermal absorption. A number of alternative control measures are known, with various degrees of economic and biological effectiveness. One of the most promising is use of the larval parasitoid *Asecodes hispinarum*, which has been reared and introduced in Vietnam and other countries with positive initial results. The aim of this project is to investigate the infestation level of the beetle and the effectiveness of potential biological control species. Suitable species will be reared in Cambodia, trial field releases carried out and extension staff trained on pest/ parasitoid biology and biological control methods.

Project ID: DAALI 79 Production and use of effective parasitoids to control Diamondback moth (DBM) on lowland cruciferous crops in Cambodia

Lead Organisation: Department of Agronomy and Agricultural Land Improvement (DAALI), Ministry of Agriculture Fisheries and Forestry (MAFF)

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Collaborating Institutions:

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- Department of Agriculture, Fisheries and Forestry, Siem Reap Province
- Nong Lam University of Agriculture, Ho Chi Minh City, Vietnam

Project Budget: USD$19,702.00

Project Duration: May 2005 – May 2007

Project Overview:

Vegetables are the second most important Cambodian crop (following rice) and serve as a primary cheap source of nutrition for lower income families. One of the constraints on the vegetable industry is infestation by insect pests, particularly diamondback moth (DBM) which causes reductions in yield and quality, especially for cruciferous vegetable crops (for example cabbage, broccoli, mustard and canola). In extreme cases, the diamond back moth can completely destroy crops. This forces farmers to use large quantities of chemical pesticides for its control, yet the worst outbreaks occur in areas with no natural biological control that completely rely on chemical pesticides.

One of the most 'environmental and human health' friendly alternatives for the control DBM is through the use of appropriate bio-agents. Many parasitoids of DBM have been recorded, however their effectiveness depends on climate and habitat. The purpose of this study is to examine the potential for the use of locally available bio-agents for the control of diamondback moth in cruciferous crops grown under smallholder conditions in Cambodia, and to carry out field releases of the most appropriate agent/s.

Project ID: KCNSA 95 Assessment of improvements in rice production technology in Stung Trang District, Kampong Cham Province

Lead Organisation: Kampong Cham National School of Agriculture (KCNSA)

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Collaborating Institutions:

- Department of Agronomy and Agriculture Land Improvement, Ministry of Agriculture, Forestry and Fisheries (MAFF)
- Seed Testing and Quality Control Laboratory, Department of Agriculture, Kampong Cham Province
- Cambodian Agricultural Research and Development Institute (CARDI)

Project Budget: USD$22,992.00

Project Duration: July 2005 – April 2008

Project Overview:

Advancements in management techniques have improved rice productivity across much of Cambodia. However, due to their remote location, farmers in the Stung Trang District have had little access to technical advice and inputs which could have bought about significant improvements in rice yields. Yields in the district remain low, even when compared with other areas of Kampong Cham province.

This project aims to assess elements of the System of Rice Intensification (SRI) to this district, this system improves rice production through high yield, reduced seed input and low external input. This will also involve the identification of specific management techniques capable of bringing about substantial improvements. Initial season's results show that it is possible to transplant the rice much earlier (15 days rather than 30-40 days) at lower sowing rates (2-3 stems/hill). Other elements of SRI, such as draining and wetting cycles for fields may meet with farmer resistance because they increase risk and labour requirements. This research will benefit local farmers through crop production improvements and increased food security.

Project ID: MVU 74 Improvement of cattle nutrition by the introduction of appropriate forage in Kamchai Mear, Prey Veng province

Lead Organisation: Maharishi Vedic University

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Collaborating Institutions:

- National Animal Health and Production Investigation Center
- Prey Veng Agricultural Department, Office of Animal Health and Production
- CIAT (International Center for Tropical Agriculture), Vientiane Laos

Project Budget: USD$17,105.00

Project Duration: July 2005 – June 2007

Project Overview:

The population of Prey Veng province regularly faces poverty and food security problems. This is partially due to infertile, acidic soils which give low crop yields. Farmers in the province are primarily rice farmers, and they could utilise their land more efficiently if they could diversify their crop production. This project will identify varieties of forage that are well adapted to the soil and climate in the province. Six types of legume and grass forages have been analysed in initial experiments. Introducing forage varieties suitable for infertile and extremely acid soils, and a long dry season, will provide new alternatives for farmers and give them the opportunity to adequately feed their cattle. As a result, this will increase livestock production, and improve their draught power. Farmers will also get more manure to fertilize their lands which will reduce the need to buy chemical fertilizers. It is also expected that improved diet will reduce cattle gastrointestinal parasite load. Consequently, farmers' revenues are likely to increase since their livestock will be of better quality and the number of cattle produced is also likely to increase each year. Food security is also likely to be improved.

Project ID: PLNSA 97 Improvement of groundnut (*Arachis hypogaea L.*) management and production through farmers participatory research

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Collaborating Institutions:

- Cambodian Agricultural Research and Development Institute (CARDI)

Project Budget: USD$13,170.00

Project Duration: August 2005 – September 2007

Project Overview:

In Cambodia the groundnut, or peanut, is mainly grown on small farms, particularly along the Mekong River, as a dry season crop. Groundnut is used for human consumption and animal feed, and it is also an important source of livelihood for farmers. Most small farms grow groundnut for home consumption, selling excess at local markets. However, demand usually exceeds supply because of limited cultivation area and low yield.

The objective of this project is to increase groundnut (*Arachis hypogaea L.)* yield and farmers' income through development and application of improved cultivation techniques for dry season of groundnut along Tonle Sap. The work is based on farmer participatory research and will include selecting, testing, evaluating, and adapting improved varieties and improved cultivation techniques for the farmer's particular agro-ecological and socio-economic conditions.

Project ID: RUA 71 An evaluation of the potential for smallholder Dragon fruit (Red Pitaya: *Helocereus var.*) cultivation under Cambodian conditions

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Collaborating Institutions:

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- Provincial Department of Agriculture, Forestry and Fisheries, Kampot
- German Embassy in Cambodia
- Rural Development Program, German Agency for Technical Cooperation (GTZ)

Project Budget: USD$11,893.00

Project Duration: May 2005 – April 2008

Project Overview:

The diversity and quantity of dragon fruit produced in Cambodia is relatively low, which has lead to the fruit market being dominated by imports from Vietnam and Thailand. However, dragon fruit is well known and widely accepted in Cambodia, and there is a move to establish smallholder and commercial farming of this species. Very little input is required which makes it suitable for cultivation by smallholders who have limited resources. The climate and soils of Cambodia are regarded as being suitable for the dragon fruit cultivation and production. The aim of this project is to assess the potential (in both agronomic and economic terms) for dragon fruit cultivation in Cambodia, and to develop appropriate propagation and management practices. It is anticipated that dragon fruit will show potential for smallholder production, and the appropriate management recommendations will be formulated and distributed for extension purposes. This is important because there is currently little or no literature in Khymer on the production of dragon fruit.

Project ID: RUA 72 The System of Rice Intensification (SRI) in the Cambodian context

Lead Organisation: Royal University of Agriculture

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Collaborating Institutions:

- German Development Service (DED – Deutscher Entwicklungsdienst)
- Cornell International Institute for Food Agriculture and Development (CIIFAD)
- Centre d'Etude et de Developpement Agricole Cambodgien (CEDAC)
- Rural Development Program, Centre for International Migration and Development, German Agency for Technical Cooperation (GTZ-RDP)
- Institute of Plant Production and Agroecology in the Tropics and Subtropics, University of Hohenheim
- International Rice Research Institute (IRRI)

Project Budget: USD$21,170.00

Project Duration: April 2005 – February 2008

Project Overview:

The System of Rice Intensification (SRI) was introduced into Cambodia in 1999 and a recent survey indicates up to 40,000 farmers are practicing elements of SRI on their rice fields. In many cases the results of these efforts are encouraging, with yield increases over a wide range of agro-ecological environments, management practices and rice varieties. However, SRI remains controversial and the benefits are currently being debated. Apart from debate over the need to pay much closer attention to weed and water management under SRI and the need for additional labour inputs, one of the most controversial areas in SRI is nutrient balance and management. Little is known about the effects of SRI on soil nutrients and chemical properties, especially nitrogen. This project aims to provide more scientific data on SRI practices in Cambodia. This will include field trials on rice variety, fertilisation, soil-type, weeding, seedling age and planting distance. The outcome of these trials will further help to understand SRI, and recommendations can be passed onto farmers.

Project ID: RUA 76 Seed production by semi-artificial breeding of Snake Skin Gourami (*Trichogaster Pectoralis*) in Svay Rieng Province

Lead Organisation: Royal University of Agriculture

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Collaborating Institutions:

- Provincial Agriculture Department, Svay Rieng
- Support Program for the Agricultural Sector in Cambodia (PRASAC)
- Svay Rieng Fisheries Office
- Partnership for Development in Kampuchea (PADEK)

Project Budget: USD$5,000.00

Project Duration: May 2005 – April 2006

Project Overview:

Fish resources in Cambodian waters are facing severe threats through over-harvesting, illegal fishing and other human activities. These threats have led to an increase in the role aquaculture plays in fish production. Many research studies are also focusing on breeding indigenous species. This project aims to promote the supply of local indigenous fish species seed. This will support farmer demand in the region, and help keep natural brood stocks at sustainable levels.

This project will focus on Snakeskin Gourami (*Trichogaster pectoralis*) and attempts semi-artificial breeding to avoid seed collection from natural water bodies. This species has been chosen because it is the most viable local fish species to help extend the aquaculture industry, while improving living standard and for local people.

Project ID: RUA 77 Technology transfer to the farming community in Santouk district, Kampong Thom province of breeding and nursery technologies for *Babodes altus* and *Trigogaster petoralis*

Lead Organisation: Royal University of Agriculture

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Collaborating Institutions:

- Fisheries Office, Kg Thom Province
- Group de Recherche et d'Echanges Technologique (GRET), Kg Thmar
- Centre d'Etude et de Developpement Agricole Cambodgien (CEDAC)

Project Budget: USD$4,715.00

Project Duration: January 2006 – December 2006

Project Overview:

This project is building on previous research which aimed to promote small-scale fisheries in rice fields within irrigation areas. The previous research indicated that farmers had a strong motivation to develop rice-fish culture as it reduces the expenditure in fertilizing rice fields, providing fish for families' consumption and increased rice yields. Following the initial research farmers in the area were concerned about the availability of fish seed to restock their ponds. This project is extending aquaculture techniques to allow farmers to capitalise on small-scale breeding and nursing for aquaculture and decrease fishing from natural water bodies. Some of the constraints identified during farmer surveys that were carried out in this project include seed availability, slow fish growth rates, seasonal labour availability, and seasonal water availability for ponds.

Project ID: RUA 93 Extension of Technique of Fish Nutrition Utilization for Small-scale Aquaculture in Kampong Speu Province, Cambodia

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Collaborating Institutions:

- National School of Agronomy, Toulouse (ENSAT), France
- Asian Institute of Technology (AIT), Outreach program, Kampong Speu Province

Project Budget: USD$5,000.00

Project Duration: May 2005 – April 2006

Project Overview:

Fish nutrition and feeding plays a central and important role in sustained development of aquaculture and, as such fertilizers and feed resources continue to dominate aquaculture requirements. In order to maximise production and increase household sustainability, farmers need to include supplements in their feeding regime, for example green vegetables. Two main green vegetables; water spinach and green spinach, were recommended in a previous feed analysis during the CARF project "*fish feed composition for small-scale aquaculture in Kampong Speu Province*."

However, these recommendations have not been implemented due to a lack of appropriate technical recommendations on development and use of feed supplements in small-scale aquaculture, based on locally available resources. This project aims to evaluate a number of locally available feed types, and develop technical recommendations to maximise production in small-scale fisheries units. It is hoped that these recommendations will help small-scale aquaculture attain sustainability, and increase farmer awareness of the importance of feed composition.

Project ID: RUA 96 Study of women's power in agricultural management at Kampong Svay district, Kampong Thom province (Student Project)

Lead Organisation: Royal University of Agriculture (RUA)

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Collaborating Institutions:

- None

Project Budget: USD$350.00

Project Duration: May 2005 – September 2005

Project Overview:

Cambodian women play an important role in agricultural development, however, their input is considered by some to be inferior to that of males. Recognition of women in the agricultural industry is particularly important in developing countries which primarily aim to boost rural economies and sustain adequate food supplies. Although women have an important role to play in agriculture development, traditional social structures and beliefs place them in the home and may not recognise their value in the workforce.

Education and literacy are highly valued in Cambodia however young females are often removed from school to care for siblings and help with household chores and agricultural activities. In a typical family men concentrate on income-generating work (both on and off farm), while women combine income-generating work, on-farm agriculture, household tasks and child care. This project aims to assess the role of men and women in agricultural work, in terms of labour and income. This can then be used to determine a fair income for women, based on their input in the workforce rather than their gender.

Project ID: RUA 101 A study of the effect of fruit dropping on postharvest quality of 'Keochen' Mango (Student Project)

Lead Organisation: Royal University of Agriculture (RUA)

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Collaborating Institutions:

- None

Project Budget: USD$345.00

Project Duration: May 2005 – August 2005

Project Overview:

'Keochen' mango (*Magnifera indica L.*) is one of the most popular mango varieties in Cambodia because of it attractive colour, delicious taste and excellent nutritional properties. However, mango is a highly perishable fruit, and successful harvesting is dependent on stage of maturity, careful sorting, grading and marketing. Factors like stage of fruit maturity at harvest, method of harvest, handling during transportation and temperature and method of ripening determine the development of typical aroma and taste. Faulty methods of harvesting cause a lot of damage and bruising of the fruits, which is the main cause of fruit spoilage. Correct harvesting and postharvesting handling enhances shelf life and improves the value of the fruit.

The aim of this research work is to evaluate the effect of fruit dropping from the tree on postharvest storability of 'Keochen' mango. This knowledge can then be passed onto farmers and producers to improve the quality of their produce which will lead to increased financial returns.

Project ID: RUA 106 The promotion of cultivation of saprophytic edible mushroom and the development of sustainable spawn supply

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Collaborating Institutions:

- German Development Service Project, Royal University of Agriculture
- French and Chinese embassies in Phnom Penh

Project Budget: USD$18,255.00

Project Duration: May 2005 – December 2007

Project Overview:

The cultivation of saprophytic edible mushrooms (such as straw and oyster mushrooms) has the potential to meet significant demand from domestic markets. Cambodia is suitable for the cultivation of saprophytic edible mushrooms, in terms of availability of rice straw and manpower, and climatic conditions. Most of the provinces in Cambodia are used for rice farming and left fallow between cultivation periods. These farmers often have large quantities of raw material for composting available (for example rice straw) and appropriate environmental conditions (including temperature and relative humidity) the cultivation of saprophytic edible mushrooms is a viable means to increase their income. This project aims to promote the cultivation of saprophytic edible mushrooms using improved technologies, build capacity among Cambodian agriculture graduates in mushroom production technology and to develop and disseminate cultivation techniques suitable for various environments and production levels. It also aims to provide mushroom spawn to farmers through local breeding centres.