

Victor Wall

Ricks Center for Gifted Children

Denver, CO

Thailand, Factor 7: Animal Agriculture

## **Pairing Poultry and Cricket Farming as a Diversification Opportunity for Improved Income and Food Security for Rural Thai Families**

One of the biggest challenges facing rural Thai farmers and families is a lack of an economic buffer, thereby putting family food security and livelihoods at risk. As of 2013, over 80% of the country's 7.3 million poor reside in rural areas. Moreover, an additional 6.7 million were living within 20% above the national poverty line, and were at risk for falling back into poverty (World Bank). "For the poor, food constitutes a considerable portion of the expenditure, making access to food amongst rural Thai people a challenge. Food expenditures in rural areas equate to approximately 40.4% in 1990 and 37.0% in 1999 of total family expenditures (Kosulwat). The high food price and inflation rate directly affect their livelihood status. The small-farmers are the ones who are hardly hit by soaring input prices and rising production cost." (Isvilanonda). Traditionally, Thai farm crops have been rice, corn, and soy, with some emphasis on cassava and sugar. Though profitable, rice has only one crop per yield. Furthermore, Thai farmers have traditionally only grown one crop, thus increasing the chances of financial failure. Health-care wise, Thailand's universal health care system covers 99.9% of the population, but rural areas are facing more critical challenges due to a shortage of trained medical staff, having only one doctor for every 5,308 people within the northeastern province alone (Leavitt). "The average annual income is 196,389 baht (\$5,692 US) per household or about 49,719 baht (\$1,441 US) per capita. This amount of income is three times lower than that of the blue collar workers. The low income of farm and rural households have inevitably led them to living a poorer quality of life. "The typical family size is 3.95 per household." (Isvilanonda). As it is, the average Thai family is currently nuclear, though this is rapidly changing, as extended families comprise roughly half of the Thai population. The average farm size is 4 hectares per household (around 9.88 acres), with 16.2 million labor forces involved within agricultural activities. "Approximately ninety percent of rural Thai people, or 5.2 million farm families earn their income through subsistence farming, particularly rice cultivation and other field production." (Chainuvati and Athipanan). Rice is approximately 44% of daily calories for rural Thais. (National Statistics Office and Office of Agricultural Economics of the Kingdom of Thailand). While major educational improvements have been experienced in Thailand nationwide with 12 years of free basic education and increases in secondary school enrollment to 78%, students enrolled in village schools in rural areas are still lagging behind (Chainuvati and Athipan). Forty-seven per cent of 15-year old students in these areas are functionally illiterate. (World Bank).

### **Diversification as a means for improved income and food security**

This paper explores cricket farming as a viable method for providing supplemental income and reducing economic vulnerability for rural family poultry farmers. It also addresses the benefits that can arise from employing this diversification mechanism.

Currently, rice is the main food source in Thailand, "with the Northeastern part of the country accounting for the largest share of both rice area and production (50.21% and 34.68%, respectively). Household rice production in the region is mostly for food self-sufficiency" (Isvilanonda).

Diversifying of agricultural activities is not new to rural Thai family farmers. Introducing fish ponds with cattle farming or rice farming, for example, has been extensively and successfully executed and studied. However, little research has been done around potentially effective agricultural pairings for poultry farming. Family or small-scale poultry farming in Northeastern rural Thailand has been an integral part of the Thai farmer's lifestyle.

International studies have shown that family poultry farming exclusively is an effective method of reducing poverty (Thieme, Sonaiya, Rota, Alders, Saleque, and De'Besi). Market-wise, Thai indigenous chickens (TICS) or "village chickens", as commonly known, rarely face price problems because of its high meat quality. Yet there are challenges, particularly pertaining to increasing production and maintaining poultry health which can negatively impact food and financial security.

### **Rural family poultry farming challenges and opportunities**

The cost to maintain the health and efficacy of TICS has risen. Most small scale farmers allow TICS to roam free-range, scavenging for food, but supplementing this foraging with chicken feed, be it local or commercial, in order to maintain the livelihood and profitability of the chickens (Thieme, Sonaiya, Rota, Alders, Saleque, and De'Besi ). Scavenging has increasingly become a risky process, due to diseases and parasites being encountered, and an ingestion risk for garbage. Chicken feed can be hard to access and regulate, as some farmers store it beyond its intended date, effectively wasting the feed whereas others attempt to create their own, which may not carry sufficient nutritional value. Feed, commonly composed of broken rice, rice bran, corn kernels, and cassava chips, is typically not enough to sustain a TIC's daily energy value. Furthermore, the risks of illnesses such as Newcastle Disease, Fowl Pox, Fowl Cholera, and Avian Influenza (HPAI) serve as another factor of concern.

TICs serve as both a commodity and a food source (Chopkarn, Kreingraki, and Wongpichet). Coupled with the already high poultry mortality rates of 50-70% ("Periods of seasonal change are critical times of high mortality; about 30-70 percent of birds in a flock die annually [Chopkarn, Kreingraki, and Wongpichet]), these losses could be severe for a rural family. Fifty to seventy per cent of chickens produced are utilized for consumption, and the remaining 30% are sold for income. (Chopkarn, Kreingraki, and Wongpichet). Furthermore, the lack of interest from the younger generations could bode ill for succession planning of poultry farming. Given the age of most of the farmers, the majority of their prospective successors have already left for jobs within the city, returning to assist in harvest seasons, or participate in festivals. (Chopkarn, Kreingraki, and Wongpichet).

To mitigate some of these risks and to improve the livelihood of rural poultry farmers and families, it is important to pursue methods to expand and diversify poultry farmers' income source.

### **An Overview of Cricket Farming**

Cricket farming has been a Thai profession since 1998, (Food and Agriculture Organization of the United Nations), and as of April 2017, Thailand contains "some of the most advanced cricket farms in the world" (Halloran, Afton, Roos, and Hanboonsong). In a joint study by the University of Copenhagen and Kohn Kaen University, researchers classified crickets as "... a more sustainable kind of animal source feed." (Halloran, Afton, Roos, and Hanboonsong).

Sixty per cent of cricket breeders in Northeast Thailand are women, and one or two people can man a cricket farm and eggs can be bought from another farmer who sell them at about 50 baht (almost \$2) a bowl or by catching them from the wild. Farmers prefer to breed house crickets rather than native species

due to taste. They are bred in containers such as concrete cylinder pens or block pens, plywood boxes or plastic drawers. A large farm will have 60-80 breeding containers and requires 2-3 hours a day of labor to care for them. (Hanboonsong, Jamjanya, Durst).

The financial barrier to entry is also fairly low. The cost to start up a cricket farm ranges from 500 baht (\$13 US), to 100,000 (\$3300 US) or more ((Yhoung-Aree, Jintana, Chavist, and Kunsanong)). Supplemental income that can be earned ranges from 60 baht (\$2 US) per kilogram to 400 (\$12 US) baht per kilogram of crickets. Crickets appeal to domestic consumers of all income levels (i.e. factory workers, employees of various types of agencies and tourists both Thai and foreigners) and neighboring countries (Yhoung-Aree, Jintana, Chavist, and Kunsanong). The product itself has a high profit margin and low risk due to the high market needs.

### **Pairing chicken farming with cricket farming**

First started in the 1990s by migrant workers, cricket farming is comparatively inexpensive, as shown by the Food and Agriculture Organization web site, easy to do, and relatively profitable. For the elderly, it serves as a method to become self-sufficient and not reliant upon the handouts from their children. For women, it enables them to become income producing family members while not leaving home. One example of this was a woman who utilizes it as a supplemental source of income, while her husband works in Singapore and Taiwan in the construction industry (Halloran, Afton, Roos, and Hanboonsong).

Existing resources can be shared between cricket and chicken farming, particularly for feed. One method of feeding crickets is utilizing chicken feed, and mixing it with cassava meal. Cassava meal is typically used in poultry farms (Chopkarn, Kreingraki, and Wongpichet). TICs also consume insects as part of their free-range diet and job as “yard cleaner” and both crickets and chickens consume organic waste as part of their diet. This diverse mix of feed also allows for healthier chickens, which could assist in tackling high poultry mortality rates.

In addition, rural farmers and their families gain a valuable high protein food source as crickets provide up to 12.5% of daily dietary value for protein, and 17% of vitamin B12 (Axe). Already a food staple in the region, rural Thai farmers can roast the crickets and mill them for flour. This is particularly beneficial as poultry farmers often experience a shortage of food (including chickens) during festivals, harvest, and when family members return home.

Cricket farming also has the potential to additionally facilitate community engagement. Due to a need to diversify the cricket gene pool to maintain a healthy and marketable breeding stock, cooperation between neighboring cricket farmers is necessary, from the exchange of ova to the sharing of different “recipes” for feed to breed healthier cricket yields.

Though the potential benefits to cricket farming are immense, they do not come without their drawbacks. The elderly and women both tend to be more averse to making new investments (Halloran, Afton, Roos, and Hanboonsong). Thus, convincing them to invest in this new practice may be challenging. However, this could be rectified with the implementation of workshops done by resident or area farmers. Finding support, knowledge and resources are also key problems. While innovative research stemming from leading Thai agricultural universities have sprung up over the past five years, there is still little information available through the government about cricket farming.

Other drawbacks include the risk of disease within the confines of the cricket farm, and once it has been identified, the typical course of action is to destroy the entire farm. The most common disease is a fungal infection commonly known as Cricket paralysis. Crickets are susceptible to other pests and extreme weather changes. Inbreeding is also problematic, leading to progressively weaker crickets. Organized ova trading between cricket farmers could reduce inbreeding risks, and facilitate community engagement.

## **Government, Community, Research and Private Sector Support**

For this diversification approach to succeed, it is necessary to implement a series of programs and policies from multiple organizations. Creating such an infrastructure serves as a means to kick-start the pairing and further its adoption and sustainability. In order to do so, the following proposed suggestions should be considered.

*Research:* While poultry farming is somewhat mature in practice, cricket farming – and the exploration of poultry pairing- still requires significant research. While groundwork has been laid for data collection in both individual areas of animal agriculture, there is need for deeper research for application and field studies of the combined. The development of procedures and protocol are also necessary. Sanitation methods, disease studies, feed studies, and modifications of the cricket crop would assist in the integration of the cricket farms with poultry farms. International organizations such as the United Nations can continue to fund research in this area.

*Cooperation between farms and consortiums:* Due to the detrimental effects of cricket inbreeding (Yhoung-Aree, Jintana, Chavist, and Kunsanong), the exchange of breeding stock between farmers should be encouraged, as it will reduce mortality rates within both farms, and potentially create new hybrid combinations. Yet cooperation should not stop between the exchange of vital stock. Local wisdom between farmers tends to be more trusted and engaging village elders and early adopters is key. In a study published by the Food and Agricultural Organization, eighty four per cent of the farmers learned the operation of cricket farming from friends and relatives (Yhoung-aree, Chavasit and Khunsanong). The foundation of a consortium would be beneficial, as it would allow for a larger market, the creation of a standardized process, and an increased negotiating leverage when dealing with larger entities.

*Creative funding sources:* Early research shows that most cricket farmers invest with their savings (Yhoung-aree, Visith Chavasit, and Khunsanong). Assistance from the government would be beneficial for small scale dual poultry and cricket farmers. Low interest micro-loans would allow small-scale farmers access to capital that they would otherwise not be able to obtain. The government should focus on not only aiding farmers, but also communicating the efficacy of the process to more skeptical government officials who work directly with the farmers.

Other funding sources could derive from both the communities themselves and the markets they sell to. Rural Thai farmers already tend to have community lending mechanisms. This could be extended online by establishing a version of a “GoFundMe” for rural family farmers where neighbors could help fund neighbors. Though only 26.5% of Thai families had internet access in 2012 (UNICEF), many commercial internet shops and cafes provide the service. Furthermore, of the Internet access provided, many are community networks, in the style of Guifi, Freifunk, and AWMN. This shared method allows for an entire village to have internet, and effectively share any costs amongst themselves. One such example is Taknet, which allowed for many rural residents increased internet access. With it, the villagers split the subscription cost, reducing the fee from 28 US dollars to five (Understanding Internet Usage,)

*The private sector:* both domestic and international companies can also be involved. “An international edible insect movement is emerging as 73 of the 98 edible insect companies known were founded during 2013-2015” (Muller, Evans, Payne, and Roberts). These organizations, particularly the ones who import crickets from Thailand, could be provided incentives in the form of tax credits, government subsidized or guaranteed loans for supporting small scale family farmers. Other institutions such as the World Bank can facilitate these efforts by providing capital and expertise.

*Pilot projects:* The implementation of pilot projects would enable information to be more efficiently spread. Some local Thai universities such as Kasetsart University, Mahidol University and Khon Khaen University have initiated or examined demonstration projects in the region for cricket farming. The next step is to identify demonstration projects that pair poultry farming and cricket farming.

*Intergenerational training:* To distribute and transfer the knowledge gained about the pairing of poultry and cricket farming, it is important to educate children so they can contribute to the family livelihood and also have the skills to improve their lives and family food security. As the 1999 Education Act grants educational rights to all children (UNICEF), combining farm training within general curriculum would provide a method of large scale education. For example, crickets have been successfully introduced into primary school lunch programs as has integrating cricket-breeding lessons at cricket farms set up by school and cricket cooking contests (Haboonsong, Jamjanya, and Durst).

Relatively simple to implement, profitable, and with investment, sustainable, this diversification mechanism can provide an economic blanket for rural Thai families for food security while also enabling new, marketable agro practices to reduce the risk of poverty. It also opens up fresh avenues for further research. For instance, with the implementation of microfortification, crickets could serve as an effective counter to microdeficiencies, such as iodine and iron, which is more prevalent with rural children under five. Environmental impacts are another area for exploration. Insects are considered a more “environmentally friendly source.” In terms of anthropology, studies on westernization could be launched, allowing for a better understanding of western influences on Thai cricket consumption. Examining market demands for crickets and success factors that increase that demand such as marketing, packaging, and innovative recipes could also provide insight to cricket farmers and in some cases, perhaps allow those who are entrepreneurial and have more capital to extend their yield to production. It may also be beneficial to study the productivity of poultry farms upon the introduction of crickets as well as

The pairing of cricket farming with poultry farming would be a way for Thai rural families to reduce risk of reliance on one food source and could serve as a cost effective and complementary way to supplement income for security for income gain, and autonomy for many northeastern farmers, particularly for women and children who remain on farms when male members migrate to cities. Relatively simple to implement, profitable, and with investment, sustainable, this diversification mechanism can provide an economic blanket for rural Thai families for food security while also enabling new, marketable agro practices to reduce the risk of poverty.

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