Recent Research

1. **Controlling shade avoidance response as an avenue to increase potential crop yield**

A lowered ratio of red and far-red irradiance (R:FR) is a warning signal for future competition, triggering plant morphogenic responses for shade avoidance, seen as increased apical dominance and reduced axillary bud growth. The growth and survival of tillers in wheat controlled by R:FR determines the final number of spike which is a major component of wheat yield. This study tests the hypothesis whether the reducing shade avoidance response increase the number of tiller in wheat or branch in soybean, and therefore increase yield potential.

2. **Rice cultivation with drip irrigation for water-saving and greenhouse gas mitigation**

Drip irrigation system, which has been developed for water-saving in arid land agriculture, is now applied to large-scale upland rice cultivation in some countries. In this study, drip rice cultivation in upland field is performed to estimate how much water could be saved compared to paddy, and to evaluate the emission reduction of methane: because paddy rice is one of the major source of methane emission in agriculture.

3. **Ecophysiological approaches to maximize potential yield of Japanese soybean**

Japanese soybean yield (1.6 t/ha) is only half of that in advanced cultivation country. This study aimed to optimize light interception and radiation use efficiency in soybean canopy using different cultivars or environment to improve cultivar and cultivation technologies, and to maximize potential yield of Japanese soybean.

Publications


Recent Research

1. Communication for Production Area renovation

For the production promotion of Kagawa, agriculture features multi-items small volume production. In promoting the production of new brand agricultural products, there are issues such as changing the allocation of labor by type and cropping type. We developed a land use model and examined issues of agreement formation between shipping organization and producers.

2. Rural management and facilitation

The sustainment of the community is a serious in the hilly area. Activities such as the creation of regional special products and initiatives for events are being made. We are conducting an intention survey on the evaluation of visitors of the event. We examined the human resources training in organizations in agriculture and rural areas, especially the facilitation type leadership to promote collaboration.

3. Regional integration and price transmission

For the economic development of the East Africa region, application of economic evaluation of easing of food import restrictions by the EU, computer general equilibrium model analysis. In Turkey, structural transformation due to EU accession for the agriculture by food supply and demand model.

Interdependence relationship between grain market and crude oil market in international market was analyzed.

4. Impact Evaluation to development issues

Based on the experiences in evaluating multi-functionality in agriculture project, we evaluated the impact (the difference between outcome of treatment group and outcome of control group) with agricultural village survey in Kagawa. We will adapt to access various policy interventions.

Publications

Recent Research

1. Mechanism analysis of agricultural damage causing by natural disasters

Recently large scale disasters caused by unusual weather have become more frequent in Japan and agricultural damage tend to increase too. According to the IPCC’s current findings, it is expected that extreme weather, such as heat wave and cool summer, is more likely to appear in future. Mechanism of global warming have been clarified a lot scientifically, but then mitigation method of agricultural damage was not enough studied. In my laboratory, the methods that mitigate high stress of plants and animals at severe event by physical way are studied.

2. Development of unused natural energy resources and effective use for agriculture

Agricultural climate resources is the idea that climate is assessed as the resources. It follows that temperature, solar radiation and precipitation are natural energy resources. Irrigation reservoir with a wide distribution in west Japan has cold energy resources at the deep bottom. In my laboratory, the effective utilization methods of cold energy resources for agriculture are investigated.

Publications


Research Area: Bioresource Production Science  
Research Specialization: Animal Science  
Name: MATSUMOTO, Yoshiki

Keywords: Neuroscience, Intestinal Villus, Microbiota, Trapping Device, Red mite, Feeding environment and Poultry health.

Research Interests

Our primary interest is the development of functional animal production sciences, widely anatomy and physiology, statistically detecting the target molecule expression and localization, quantitative absorbed amino acid using new imaging methods on an intestine villus tips and contributing for future industrial sustainability. Particularly, this is very topical and important for safety animal products, poultry health that has affected by intestinal microbiota, and in understanding and developing theoretical principles of feeding environment.

1. Gut mucosal functions and health in poultry

The poultry industry needs more stable production which will require an improved environment for layers and better health controls. One major health and environmental concern is caused by feeding related microbiota on intestinal villus. Fourier Transform Infrared imaging (FT-IRI) is possible to analyze collagen maturity, crystallization and calcification, and to estimate organic compound by analyzing atomic bonds (-C=O -O-H -PO₄³⁻ etc.) in tissues. FT-IRI and MALDI-TOF MSI are establishing new methods to evaluate certain nutrient absorption in terms of morphology and physiology combined with SEM and light microscope.

2. Epidemiological research and developing ectoparasite trap devices

Dermanyssus gallinae (De Geer, 1778), known as the “red mite,” is a hematophagia ectoparasite, commonly found in laying hens and is one of the most important epidemiological and economic problems. We have developed an electrostatic charged device (i-Trap®, Kondo-Electric Co., Ltd.) which can attract and capture red mites without the use chemicals or insecticides. This device has an electrical charge from static electricity that is created by the polyurethane composition of the material. This allows for quantification of the red mite infestation population from which the contamination level for red mites can be determined.

Publications
- Egg collagen content is increased by a diet supplemented with wood charcoal powder containing wood vinegar liquid, *British Poultry Science*, 57, 601-611, 2016, Yamauchi K, Matsumoto Y and Yamauchi KE.
- Red mite population: Increase has a direct correlation to a decrease in egg production, *17th AAAP* 1070-1074, (2016). Imade Y., Kondo T., Kayahara Y., Yamauchi K., Lutes P., Matsumoto Y.
In agriculture, farmers can obtain managerial resources by appropriate investment and employment using financial resources, and by acquiring skills with “learning by doing” on their farms. We can envision an ideal growth model of farm managements, where, accumulating and using managerial resources, farmers realize managerial strengths to earn more profits (see the figure below). In Japan, however, most farmers cannot follow such a model, thus failing to grasp growth opportunities.

In our laboratory, using economic theory and econometric tools, we analyze how socio-economic constraints lead Japanese farmers to give up following the ideal growth model, and what should be done to alleviate those constraints.

**Research issue:** Economic Analysis on the Growth Processes of Farm Managements in Japan

**Keywords:** managerial resources, managerial strengths, constraints on farm management growth

**Publications**


Keywords: crop, rice, unused resources, sustainable agriculture, organic cultivation.

Recent Research

1. Studies on Organic Cultivation of Crops

   Organic cultivation without chemical fertilizers and agrochemicals are sustainable agriculture which reduce stress to environment depending on crop production and use resources effectively. And it will be benefit for sell because of additional values.

   In our laboratory, we started organic cultivation of rice at 2005 in paddy field of University Farm. We study the effect of organic materials on weeds and rice yield. We simultaneously study organic cultivation of upland crops for crop rotation in paddy field.

2. Studies on water saving cultivation of paddy rice

   It will be important for the future concerned water shortage to accumulate the information about water saving cultivation of rice.

   In our laboratory, we introduce drip irrigation system to paddy field of University Farm, and study the effect of this system on water saving extent and rice yield.

3. Studies on water saving cultivation of paddy rice

   There are many unused resources, for example, food waste, waste from vegetable shipping adjustment, etc.. We study to use them to crop production as organic materials. Now, we investigate to use sake cake and food waste to rice or vegetable production.

Publications

Combined application of oil cake and rice bran reduced the number of weeds and increased the yield of paddy rice in a paddy field incorporated with white clover, 9th Asian Crop Sci. Association Conference, 287, 2017, Sugimoto, H., Araki T., Morokuma, M. and Hossain S.T.


Keywords: black soldier fly, sustainable agriculture, swine, rabbit

Recent Research

1. Development of Sustainable Food production System Using the Functions of Insects

At a Global level, the use of insect as waste bioconverters for the production of innovative products is a very hot topic. The larvae stage of the Black soldier fly, *Hermetia illucens* (BSF) can convert large volumes of low-grade organic substrates into valuable biomass.

We evaluate the products (FEED and FERTILIZER) obtained through the bioconversion of organic waste by BSF larvae.

2. Effect of Feeding Unused Resources on pig nutrition

We use unused food by-products and insect feed as raw materials for feeds, and investigate what kind of change will occur in pigs by digestion trial, intestinal flora analysis, metabolome analysis, etc.

3. Elucidation of feeding habit and gastrointestinal structure of rabbits

Amami rabbits are designated as endangered species. In our laboratory we are investigating the eating habits of Amami rabbits using DNA analysis technology to protect Amami rabbits.

Also, rabbits eat their own feces. This behavior is supported by the colonic separation mechanism (CSM) in the rabbit’s cecum and proximal colon. It is necessary to temporarily stop the CSM when they eat micro-particles or microorganisms in the cecum as a soft feces, but its mechanism of action is not well understood.

Publications

- Transfer of blood urea nitrogen to cecal microbes and nitrogen retention in mature rabbits are increased by dietary fructooligosaccharides. Animal Science Journal 85(6), 671-677, 2014.Xiao, M., Jin, X., Kawasaki, K., Xiao, L., and Sakaguchi, E.