

Estimating in-store losses of rice and ways of reducing such losses at farmers' level for addressing food security

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Abstract

The present study aimed at assessing the in-store losses of rice caused by biotic and abiotic factors in the storage structures/containers at farmers' level. A total of 18 villages covering 5 Upazilas were selected for present investigation. In all, 220 samples of *Aus*, *Aman* and *Boro* rice farmers were selected randomly and purposively from the study areas and put into marginal, small, medium and large farm category based on their land ownerships. Data were collected through pre-tested questionnaires. Different traditional rice storage structures/containers like *Dole*, *Berh*, *Gola*, *Steel/Plastic drums*, *Motka*, *Gunny bag* and *Plastic/Polythene bags* were commonly used by farmers in the study areas. The storage time of rice varied from 3.52 to 6.59 months with the overall average being 5.5 months. Significant losses in stored rice occurred through the activities of both biotic and abiotic factors. The average in-store losses occurred for *Aus*, *Aman* and *Boro* rice were respectively 3.68, 3.80 and 4.12% with the aggregated average being 3.92%. The average in-store losses of rice in large, medium, small and marginal farmers were 4.48, 3.92, 4.0 and 3.59% respectively. The farmers suggested a number of ways for reducing in-store losses of rice including training on capacity building, awareness development for safe storage, preventive measures against biotic and abiotic factors, credit for constructing durable and functional storage structure and keeping farmers well ahead informed about the natural calamities.

Design and development of biogas plant for its year-round functional operation

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Abstract

The present study elucidates an attempt to design and develop a biogas plant for generating biogas satisfactorily, especially during the cold months, and hence the environmentally safe bio-slurry round the year incorporating the provisions for raising the temperature inside digester. The experiment was accomplished by constructing a fixed dome biogas plant of capacity 2.4 m³ beside the Concrete and Material Testing Laboratory of the Department of Farm Structure and Environmental Engineering at Bangladesh Agricultural University, Mymensingh. The Grameen Shakti (IDCoL model) was employed to construct the plant as per proposed design and specifications. The study showed that it was possible to increase the inside temperature by 4-6°C that is utmost needed to make the plant satisfactorily functional during the cold months from November - February when the slurry temperature

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goes below 20°C. The equivalent chemical fertilizer of 100 kg of bio-slurry in terms of Urea, TSP and MP were 3.30, 22.72 and 20.5 kg respectively. The construction cost of the developed plant was about Tk.45,000.00 evaluated on the basis of present market prices with expected life of the plant more than 30 years. A significant amount of money can be saved by using biogas as an alternative source of fuel, and bio-slurry instead of chemical fertilizer. This would foster the rural people to cope with the opportunity of using biogas technology contributing to national economy.

Improved potato storage facility for farm household

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Abstract

This project has started functioning from January 2012 with full financial support of SPGR, BARC to achieve the objective of developing an improved potato storage facilities at farm household so that the storage life of potato could be increased at least two additional months than that of traditional farmers' practice. An improved storage structure was constructed in the workshop of the Department of Farm Power and Machinery of Bangladesh Agricultural University, Mymensingh for experimentation with an option of air ventilation using two rotary exhaust fan, powered by three solar panels of 100 Watt each. Improved Evaporative Cooling System (ECS) was constructed at the bottom of the storage bin in which water were poured in to the evaporative chamber time to time to maintain a constant level of water. Forced air ventilation by two rotary exhaust fans, located at the top of the storage bin helped accelerate evaporate water from the evaporative chamber. There were four shelves inside the bin to store potatoes. Two varieties (Lal pakri and Diamont) and two different sizes (small and large) of potato purchased from local market of Nunuz Bazar, Kalai upozilla of Joypurhat district were stored inside the newly designed potato storage bin of 1.5 ton capacity on 24 March 2013. Potatoes were stored in four different shelves. Each shelf contained four categories of potatoes (Lal Pakri-small, Lal Pakri-large, Diamont-small and Diamont-large). All were kept in nylon netted sack. Each sack contains 10 kg of potato. In addition, ten small nylon netted sack of each one kg potato from each category was placed in each shelf for determination of moisture content, vitamin C, total sugar and starch. Farmer's traditional practice was also maintained inside the laboratory for four different categories of the potato to compare the result with the improved storage bin. The data collection from the potato storing facilities started on 1st April 2013 and continued up to November 2013. Air temperature above four shelves (inside the bin) and the temperature of potato at sixteen points were recorded by a data logger and LabView software. Air flow through the bin, RH of air inside the bin, and ambient air temperature were also measured. Sample potato was taken at 15 days interval from 16 different cells of the shelves to find out the spoilage, sprout, moisture content, vitamin C, total sugar and starch. The collected data were analyzed for meaningful interpretation. It was found that the improved potato storage bin with an air flow of $0.6 \text{ m}^3/\text{m}^2/\text{sec}$ through the bin, having four layers of potato performed better than that of farmer's traditional practice. About 18% less spoilage has been found in case of improved storage bin. Further study with this improved design at farmer's household has been recommended.

Remote controlled guti urea applicator

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Abstract

The application of *guti* urea requires 25-35% less urea and one round application per crop than that of traditional hand broadcasting method. On the other hand, yield of rice increases by 15-20 %. However, placement of *guti* urea below the soil surface is a laborious, back breaking work for farmers. Furthermore, farmer has to walk hard across the muddy field, many time which make them unwilling to work. With a view to solve the above difficulties and to provide more comfort to farmers, this research project has been initiated to develop a remote controlled *guti* urea applicator that could place *guti* urea efficiently. The necessary component of the device such as metering unit, the chassis, furrow opener and furrow closer have been designed and fabricated. The battery of required matching power and remote control mechanism has been selected. The second version of the device is now ready for testing. The test trial will be conducted very soon. The work progress is satisfactory and is on planned schedule.

Developing a database on published articles of farm power issues in Bangladesh

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Abstract

A database of research papers published on the field of farm power issues in Bangladesh was designed and developed in the department of farm power and machinery, Bangladesh Agricultural University, Mymensingh under the finance of Ministry of Science & Technology, GoB. Research papers were collected from different journals and various researchers of different universities and research institutes. A computer program was developed to search the papers according to three options: i) searching paper according to title of the research article, ii) searching paper according to author of the paper, and iii) searching paper according to keyword of the paper. Five hundred and fifty publications based on availability were collected which were published from 1972 to 2013 in different journals. It was observed that most of the papers (21% of the total collected papers) were published in the Journal of Agricultural Engineering, the Institute of Engineers, Bangladesh. Twelve percentages of total collected papers were published in an international journal named Agricultural Mechanization in Asia Africa and Latin America (AMA), Japan. It is due to no charge of publications in those two journals. It was found that maximum paper (13% of the total collected papers) was published on the field of spraying, followed by solar energy (12%), and design & development of agricultural machineries (11%). It was also found that only 2% of the collected papers were published in the field of weeding. It was observed that most of the publication (20% of the

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total publications on design and development of agricultural machineries) was published in the year of 1980. In a single click in the program of database, a user will get the full paper in "Acrobat reader " and he will be able to copy or print the desired portion of the paper or full paper. This database is very easy and friendly to use. Published papers were also sorted in three major disciplines: i) machinery, ii) post harvest technology, and iii) renewable energy, mechanization & others to make a hard copy (book). The database and book will save time to search a specific publication in field of farm power issues in Bangladesh. Thus, it will be helpful to the students, researchers and teachers who are involved in research in the field of farm power issues in Bangladesh.

Design and development of an improved granular urea applicator

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Abstract

A granular urea was designed and developed in the department of Farm Power and Machinery, Bangladesh Agricultural University, under the finance of university grants commission of Bangladesh. The specific objectives of the project were; to collect existing literature on granular urea applicator (GUA), to collect existing one GUA which is mostly used in Bangladesh, to study the performance of the existing GUA in laboratory condition, to improve the design of existing GUA, to develop a GUA with the improved design, and to compare the performance of the existing and the developed GUA in respect of yield and cost of use. Research paper and reports on GUA were collected from different journals and libraries. Fund was not available for purchasing a GUA. However, different push types GUAs were available in the department of farm power machinery which were purchased by Prof. Ziauddin, under a project funded by IFDC-USA. Amin (2012) compared the performance of different push types GUAs (BARI, BRRI & Hypa made) and concluded that BRRI model was the best in performance. GUA made by BRRI was used for conducting the laboratory experiment and identified the way of improvement. Finally, a pull type improved granular urea applicator was designed and developed. Laboratory experiment was conducted by the pull type applicator to determine the performance of the applicator. The results of laboratory experiment were used to eliminate the problems of the applicator and a final version of a pull type improved GUA was developed. Laboratory experiment was finished and field experiment will be conducted in coming days.

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Identification of the functional problems and performance evaluation of reaper available in Bangladesh

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Abstract

It is indispensable to identify the functional problems of the existing reapers to popularize it in Bangladesh considering both researcher's point of view as well as farmer's point of view. Thus, this research work has been undertaken with the full financial support of MoST, Bangladesh, to achieve the above objective, and also to evaluate the present status of the reapers available in Bangladesh. About 93 numbers of reapers were found available in Bangladesh throughout the survey work out of which 59 nos are in working condition and the rest are not working. Most of the reapers have the same effective cutter bar width of 1.2 m. Among the imported reapers, Kubota shows the highest effective field capacity of 0.3 ha/hr with a field efficiency of 77.22 %. Ten important functional problems were identified through FGD with the owners, operators and users of reaper. During the survey work, the entire respondents were requested to figure out a score for each of the 10 problems in a scale of 10. Finally the scores were accumulated to find the impacts of the functional problems.

Design and development of a low cost seeder for maize cultivation

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Abstract

This research work has been undertaken with the full financial support of BAURES, BAU to achieve the objective of developing a low cost maize seeder. A manually operated push type maize seeder will be designed and developed for maize establishment. The design and construction of the seeder has already completed. A plate type metering device with 4-cell was used to calibrate the seeder. The calibration of the maize seeder is also conducted in the lab and it is now ready for the field test. A bevel gear and pinion system is adopted to operate the metering device which is powered by the axle of the wheel. Two disc-type furrow closers were set as the covering device as well as ridge builder for the maize establishment. The field and economic performance of the developed maize seeder will be conducted and the results will be compared with the manually seeding of the maize.

Water productivity of wheat and ground water level fluctuation pattern at BAU farm

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Abstract

Two field experiments were conducted at the Bangladesh Agricultural University (BAU) farm during the project period (2011 and 2012) in order to investigate the possible effects of irrigation and variety on wheat production. Both the experiments were laid out in a split-plot design and were replicated thrice. During land preparation and as top dressing recommended doses of fertilizers were used. Herbicide and insecticide were applied as and when necessary. The varieties for the first experiment were BARI Gam-21 and BARI Gam-24 and the same for the second experiment were BARI Gam-25 and BARI Gam-26. The common irrigation treatments were: I₁ - control, I₂ - 17-21 days after sowing (DAS), I₃ - (17-21 + 45-50) DAS and I₄ - (17-21 + 45-50 + 75-80) DAS. Irrigation was applied on the basis of IW (Irrigation Water) and CPE (Cumulative Pan Evaporation) ratio. The effect of variety on plant height and harvest index was significant at 1% level of probability in all cases. Considering all the outputs from the irrigated wheat experiments, it can be inferred that the fields having silt loam soil (as appeared at BAU Farm) should be irrigated thrice for BARI Gam-24 to get optimum yield and the concerned farmers may be suggested accordingly. It was also revealed that though the highest grain yield (4.59 t/ha) was found in treatment I₄, its water productivity was the lowest (841 kg/ha/cm or 8.41 kg/m³) of all the irrigation treatments. The maximum (13.00 m) and minimum (4.84 m) depths of groundwater levels were observed during early April and late October, respectively, indicating that suction mode pumps will not work at BAU farm during dry period.

Coordinated project on contaminant adulterants food chain and their mitigation: BAU component

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Abstract

The food items selected to assess adulteration during study period were spices powder (turmeric, chili, zinger, coriander and mixed spices) and miscellanies products (Mustard oil, Coconut oil, Chanachur and Noodles). Five types of turmeric powder (Radhuni, ARKO, BD, Fresh and Open market), five types of Chili powder (Radhuni, ARKO, BD, Fresh and Local Non-brand product), five types Coriander powder (Radhuni, ARKO, BD, Fresh and Local Non-brand product), Two types Cumin powder (Radhuni and ARKO), and three types mixed powder (Radhuni, ARKO and BD), Five samples of Mustard oil (Rupchada, Prodip, Radhuni, Teer and Universal tasty) four samples of coconut oil (Parashot, Juien, Cute and Hansh Marka), and five samples of soybean oil (Rupchanda, Teer, Fresh, Muskan and Lose Pack), Five samples of Chanachur (BD, PRAN, Ruchi, Bombay Sweets and Local made) and Four

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samples of noodles (Cocola, Deco, AP, Sajib) were collected from local market and analysed during July 2012 to June 2013). The chemical parameters such as, moisture, harmful food colours, acidity, preservatives (sodium benzoate, potassium-meta-bisulphite), selected minerals content (arsenic, lead, copper, zinc and tin), and microbial load such as total plate, yeast and mold counts of different brands of products were carried out in the laboratories of Departments of Food Technology and Rural Industries, Biochemistry and Microbiology and Hygiene, Bangladesh Agricultural University, Mymensingh, BSTI, Tejgoan, and SGS Bangladesh. In spices powders, moisture, total ash, non-volatile ether extracts and total bacterial count were found higher than that of Reference Value (RV). The tested oils were found to contain very high moisture, insoluble impurities, acid value, low saponification and iodine value, and low erucic acid (Mustard oil) indicating adulteration and low shelf-life. The moisture, total ash and acid value of all the Chanachur samples were found higher than that of RV indicating adulteration and susceptibility to rancidity.