Grain Storage

1	**Performance Evaluation of "West Pangasinan Insect Trap"** *by* : Restituto C. Donceras, Jr. and Ma. Elvira M. Martinez	*June 2002*

The "WEST PANG Insect Trap" which was locally developed by NFA- Western Pangasinan of Region I has by far proven its effectiveness in monitoring insect occurrence , detection of early infestation and can be operationally complemented with NFA existing pest control method .

The trap effectively monitored incidence of R. dominica in a relatively large numbers of daily trap catch per day. Cryptolestes sp were also detected in small numbers. On contrary, the trap exhibited certain limitation as it did not effectively monitor the presence of Sitophilus sp. which implied the need of adoption of other similar trapping technique applicable to other storage pests.

The "WEST PANG Insect Trap", is so simple, easy, environment-friendly, chemical free and cost-effective tool for insect detection and occurrence. They are found to be highly feasible in NFA pest control system when such measures complement with "fogging application" yielded an estimated savings of P1.9 M if adopted nationwide (569 NFA warehouses).

2	**Sealed Enclosure Fumigation Storage Technique (SEFUST) at a Reduced Fumigant Dose** by : Restituto C. Donceras Jr. , Mark Edvard Lim , Engr. Diocano D. Alojado Jr., and Ma. Elvira M. Martinez	May 2002 – November 2002

The reduced dosage for Sealed Enclosure Fumigation Storage Technique (SEFUST) at 0.5 tab/MT gave similar performance with that of the standard phosphine dose of 1 tab/MT in terms of efficiency. It had maintained good quality condition posting minimal increase of yellowing from 2.0% - 2.03% for local rice and 1.0% - 1.6% for imported Thailand rice. The percentage moisture content initially ranged from 12.8% - 13% for local rice while for Thailand rice 12.25% - 12.65%. The critical quality parameters mentioned above after four months of storage under SEFUST were still within acceptable limits set for NFA grain classification standards. The reduced dose of fumigant application had effectively controlled incidence of live insects after four (4) months of storage as measured by the level of gas concentration maintained for the duration of 14 day exposure period from registering a maximum level at 250 – 400 ppm on the 3rd day and maintaining its level at 100-200 ppm on the 14th day.

*This system is worth trying considering NFA's recent thrust of **"cost-economy measure**" as it helps in bringing down the cost of fumigant to 50% for stock treatment under SEFUST. Cost-Analysis showed a net savings of **P874.00** per pile and if fully utilized could generate a savings of **P1.35M** for 155 units for 5 year application. Likewise, the study also supports recent TRDD directions and policy re : **NFA Integrated Commodity Program (NICMP**) with the objective of reducing dependence on chemical and in so doing less exposure/ risk to chemical hazards.*

3	**Determination of the Relationship between Milling Recovery and Milling Degree** *by* : Lita B. Bernal, Tessie Q. Ramirez and Ma. Elvira M. Martinez	May 2002

The study aimed to establish the relationship between milling recovery and bran streaks, and between bran streaks and bran removal. Palay samples used were thoroughly mixed to produce a homogenous sample of the same purity, moisture content, cracked grains, and chalky and immature kernels. At least 35 samples each were milled at different milling time to produce various ranges of bran streaks (milling degree), milling recoveries, and the quantities of bran removed. Regression analysis, t-test and analysis of variance were the statistical tools adopted in the analyses of data.

An equation was derived to give the relationship of milling recovery and % bran streaks present in the rice sample. The equation is

$$Y = 62.4786 + 0.0752X$$

where Y is the % milling recovery and X is the % bran streaks. Through this equation, the milling recovery can be predicted when the % bran streaks is set.

The % bran streaks was also compared with the equivalent bran removed in rice during milling and it was found out that there was an inverse relationship between the two. The equation below expresses this relationship.

$$Y = 13.0112 - 0.0753X$$

where Y is the % bran removal and X is the % bran streaks. Thus, during milling, one can immediately predict the amount of bran to be removed if the bran streaks is immediately known at the early stages of milling. Conversely, in the absence of an analyst to perform the bran streaks, the machine operator or the milling supervisor can predict the milling degree of the rice in-process by reformatting the previously stated equation.

4	**Physical Characteristics of Paddy Procured by the NFA** *by* : Tessie Q. Ramirez, Lita B. Bernal, and Ma. Elvira M. Martinez	January 2001 – May 2002

Paddy harvested at any season of the year does not exhibit any difference. Thus, paddy harvested during the main (wet) crop season has similar characteristics with the summer (dry) crop. However, the physical characteristics of paddy harvested in one region may be different from that harvested in other region/s. One major factor for this difference is the soil characteristics; second is weather condition.

Comparing the old IR varieties that the NFA procured in the 1980s and the PSB Rc varieties it currently procures, the IR varieties manifested better milling characteristics. Likewise, the NFA mixed palay showed better milling performance compared to the pure PSB Rc varieties milled by PhilRice.

5	**Validation of Weight Loss Measurements** *by* : Tessie Q. Ramirez and Lita B. Bernal	May 2002

The weight-volume method and the thousand grain mass (TGM) are two procedures for weight loss determination for paddy. These were tested and compared with the results of the total weight loss assessment procedure.

The weight loss derived from the weight-volume method showed significant relationship with storage period. But when compared with the weight loss results of the total weight loss assessment procedure, the weight-volume method results came out to be significantly different.

The weight-volume method could be a good tool in measuring or predicting the estimated loss of stored palay. This method includes losses brought about by all possible nature-caused factors. Refinement of the procedure is therefore necessary for it to become acceptable.

On the other hand, the weight loss generated from the thousand grain mass procedure yielded insignificant relationship with storage period. Thus, it was no longer compared with the results of the total weight loss assessment. The TGM, therefore, could not be used for weight loss determination of paddy.

6	**Storage Behavior of Rice and Rice Bran Under Hermetic Storage** by : Cecilia V. de Dios, Danilo G. Natividad, Evangeline A. Tampoc, and Larry Javier	November 2003 – July 2004

*This paper discusses the results of laboratory trials exploring the benefits of hermetic storage that can be derived when storing brown rice, milled rice at various milling degrees and rice bran. A total of 33 medium size glass jars/bottles that were able to contain about a kilogram or less of rice and rice bran were used as hermetic storage vessels. The metal bottle covers were modified in order to create a "closed circuit" for O_2 measurements. Initially, all samples were observed to have zero visible infestation since the milled rice used was freshly milled and the rice bran samples were directly taken from the rice mills. After 3 to 6 months of continuous storage, oxygen concentration in rice bran, brown rice, and regular milled rice dropped to 7.6%, 10.6% and 15.9%, respectively. Although these atmospheres were not sufficient to obtain complete mortality of insects present, the modified atmosphere was able to retard insect growth and development as evidenced by weak and abnormal progenies of **Rhizopherta dominica**. Rice quality was preserved throughout the storage period. In case of rice bran, it was observed to be insect-free and of acceptable quality after 180 days in storage. The FFA content (as oleic acid) of rice bran abruptly increased from the initial 2.72% to 9.10% after 30 days of storage but gradually increased to 11.85% after 180 days in storage. According to Valdez, et al. (1987), after 60 days of storage under normal warehouse condition the mean free fatty acid of rice bran was 55.37 %. The oil content of rice bran by this time became rancid due to hydrolysis of fats thru the action of enzyme lipase which catalyzes and breaks the fat into free fatty acid and glycerine. Likewise, bran contains a substantial amount of rice germ attracting storage insects and thereby stirring rapid infestation of the commodity. Based on these trials we found support to our hypothesis that rice, brown rice and rice bran could be stored under hermetic conditions, provided the level of gas tightness was sufficient. The storage atmosphere was not only modified by insect metabolism but also through chemical oxygen depleting activity of these commodities.*

7	**Bran Streaks Level of Milled Rice at Varying Length of Storage** by : Brenda L. Andres, Christopher G. Alingod, Eleanor A. Andres, Ramon B. Cuaresma and Eleutorio G. Asuncion, Jr.	May 2004 – December 2004

The study was conducted at NFA San Juan, La Union using palay stocks with ages A, B, C, D and E. Generally, the study aimed to determine the effect of age of palay to milling performance. Specifically, 1) it aimed to establish the relationship of milling degree and the age of palay; and 2) to establish variation in milling time and polishing adjustment to attain desired milling degree. Results of the study showed that for palay with MC lower than 14%: a) the age of palay had no significant relationship to its milling performance; b) the age of palay did not affect its milling degree; and c) the bran streaks of milled rice at different milling degrees had no significant relationship with the age of palay.

8	**Quality Changes of Hybrid and Inbred Paddy at Ambient Storage** *by* : Lita B. Bernal, Tessie Q. Ramirez, and Joewell A. Monreal	February 2004 – July 2005

Damaged grains were present in both hybrid and inbred rice right after harvest but it did not significantly increase during storage even with high moisture grains stored at 18 and 20% moisture content. Both varieties did not exhibit any significant difference in terms of grain discoloration while in storage. However, there was significant difference in the formation of discolored grains at various levels of moisture content and prolonged storage with grains at high moisture having the faster rate of discoloration. The degree of whiteness of both paddy varieties was not significantly different but it decreased with time. There was also lesser degree of whiteness for stored wet grains compared to the stored dry grains. Moisture content reduction while in storage followed a similar trend for both hybrid and inbred. However, the odor and flavor of the hybrid rice were remarkably better compared to the inbred rice up to about five months. Other organoleptic properties such as tenderness, cohesiveness, and appearance remained similar for both varieties.

The milled rice recovery of hybrid and inbred rice significantly differed, with hybrid rice having a higher rice recovery. However, there was no significant difference in the milling recovery of hybrid and inbred rice at 13 and 14% moisture levels. Their headrice recovery was also similar and followed a quadratic trend when stored longer.

When dry paddy grains were mixed with wet grains, the wet grains desorbed its moisture while the dry grains readily adsorbed the moisture vapors. Moisture migration, thus, happened among the grains. However, grain discoloration occurred when the grains were stored longer.