VI. SUMMARY

This study was conducted with the objective of (i) assessing the feasibility of converting maize stover (Mst) into silage in the laboratory, (ii) assess the impact of sun drying of Mst on its nutritional value, (iii) prepare Mst silage (MstS) in a pilot scale and compare feeding value of MstS and Mst dry (MstD) for milk yield and milk quality and (iv) demonstrate the impact of feeding MstS versus MstD on lactating cows and buffaloes in field trials.

**Feasibility assessment of converting maize stover into silage:** Laboratory silage studies were conducted with maize variety NAC 6004. The crop was harvested along with ears on 75th day (dough stage) or on 100th day (physiological maturity for grain harvest) after removing the ears. Chaffed fodder was ensiled in three replicates in 10-litre polypropylene containers for 8 weeks in a 2 (stage of harvest) x 3 (treatment level) factorial design. The treatment levels were chaffed fodder as is (Control, C), chaffed fodder mixed with Jaggery @ 2% by weight (T1) and T1 + Lactobacillus (LB) (@ 100g per ton of feed) (T2). The samples were collected in triplicates from each container for chemical analysis. Palatability of silages were examined in heifers with the remainder after sampling.

The silage prepared from maize fodder dough-stage (MdoS) and maize stover (MstS) was similar in their physical properties, except the color. The MdoS was greenish yellow and MstS was yellowish green. Regardless of silage type and additive treatment the pH varied from 3.60 to 3.96 and the difference in pH was not statistically significant. The mean DM content of fodder used for MdoS was 26.0 percent whereas that used for
MstS was 41 per cent. The DM content of respective silage were 24.04 and 39.91 per cent. The differences in DM content of fodder used for silage and the silage were statistically significant (P = 0.0029).

The chemical compositions of two types of silage subjected to different additive treatments were similar except for NDF. The NDF was lowest with T1 compared with C and T2. The interaction between silage type and additive treatment was also statistically significant (P = 0.0108). The potential gas production \( D (\text{ml/200 mg DM}) \) of Control, T2 and T3 of MdoS and MstS were 99.66, 91.90, 85.10 and 66.28, 69.10, 68.54 respectively. The predicted ME (MJ/kg DM) content of MdoS (10.61) was significantly (P = 0.0220) higher than that of MstS (8.13).

**Impact of post-harvest sun drying duration on chemical composition and dry matter intake:** Four cross-bred (Bos indicus x Holstein Friesian or Jersey) heifers, aged 23 to 24 months, were chosen for the study. A portion of harvested maize stover, spread on the field for sun drying was collected from the field everyday starting from the day of harvest (day 0) until day 7 of sun drying, chaffed to a size of 1 cm for daily feeding. The heifers were fed with 1.0 kg of compound feed mixture (CFM) and \textit{ad lib} chaffed maize stover.

The chemical composition of maize stover on different days of post harvest drying changed with most significant being for CP, NDF, ADF, EE and ME. The CP changed from 4.05 on day 0 to 3.57 on day 7, NDF from 65.66 to 69.79, ADF from 47.02 to 53.96, EE from 1.52 to 1.22, RIVGP-24h from 45.56 to 42.33 and ME from 8.65 to 8.16. The mean DMI (% of body weight) on day 0 was 2.84 and on day 7 was 2.90 and the difference among days post-harvest was not statistically significant.
Effect of feeding dry stover and stover silage on dry matter intake, nutrient digestibility, milk yield and milk composition in lactating cows: Eight crossbred (Bos indicus x Holstein Friesian or Jersey) cows in mid lactation were divided into two groups of four cows in each group based on comparable milk yield, body weight, number of lactations completed and days in lactation. The diet of experimental cows was made from either MstS or MstD, FMS and CFM. The cows in group I received maize stover dry (MstD) as main roughage in the diet and cows in group II maize stover silage (MstS) in period I followed by switching over the roughage component in Period II. The chemical composition (% DM) for MstS, MstD, FMS and CFM were 85.99, 90.38, 87.67 and 83.70 OM; 4.74, 4.30, 2.80 and 17.45 CP; 66.88, 66.76, 56.52 and 62.54 NDF; 48.03, 58.21, 66.53 and 7.76 ADF; 1.66, 1.31, 0.74 and 2.89 EE; and 11.53, 12.85, 14.20 and 5.47 respectively. The RIVGP-24h (ml/200 mg DM) and ME (MJ/kg DM) were 41.96, 42.69, 36.48, 59.54 and 8.24, 8.22, 7.33, 11.88, respectively for MstS, MstD, FMS and CFM.

The DMI (kg/d) from MstS and MstD were 13.47 ±0.74 and 11.77±0.78 respectively. The difference between the two groups in DMI from maize stover was significant (P<0.0001) but not with other components of the diet. The intake of OM and CP (P<0.0001) differed between the two groups. There was no significant difference between the two groups in digestibility of any nutrient.

The average daily milk yields and 4 % FCM yield for MstS and MstD groups were 12.46 ± 0.31 and 11.55 ± 0.08; 14.15 ± 0.06 and 12.30 ± 0.03 kg respectively. The difference between the two groups was statistically significant for milk yield (P<0.007)
and 4% FCM yield (P<0.005). The mean total solids, fat content, protein, lactose, SNF and ash in milk for MstS and MstD groups were 13.92 ± 0.43 and 13.55 ± 0.12; 4.91 ± 0.12 and 4.46 ± 0.30; 3.35 ± 0.01 and 3.00 ± 0.03; 4.87 ± 0.11 and 4.46 ± 0.06; 9.05 ± 0.32 and 9.09 ± 0.06; and 0.02, 0.64 ± 0.01, respectively. The difference between the two groups in milk fat (P=0.0093), protein (P<0.081) and lactose (P<0.084) were statistically significant.

The N intake, N outgo in faeces, urine, and milk (g/day) in MstS and MstD groups were 231.10 ±21.50, 214.66 ±21.23; and 75.05 ±15.54, 70.84±14.88; 44.29±9.84, 45.22±21.69; 72.81±7.18 and 54.89±0.78, respectively. There was no significant difference between the two groups in N intake, N outgo in urine and faeces. However N-outgo in milk was significantly (P<0.002) higher in MstS compared to MstD. The N-balance (g/d) was 44.62 and 39.82 for MstS and MstD fed groups and the difference was not significant.

To assess the feasibility of adopting ensiling of maize stover in the field, feeding trials were conducted at the farmers doorstep: One low production farm of crossbred cows (LP-C), one medium production farm of crossbred cows (MP-C) and one medium production farm of buffalo (MP-B) farms were selected for the study. The selected farmers were provided with maize seeds of variety NAC 6004 for sowing. Harvesting of maize and stover silage preparation was done as per the previous experiment.

The feeding trial in each farm lasted for a total of seven weeks with one week of pre-trial observation and six weeks of feeding trial. The feeding (ad lib) trial comprised
of two weeks of MstS feeding, followed by two weeks of MstD feeding and switch back to one week of MstS feeding. The CFM was fed at the time of milking and the quantity of CFM fed was maintained uniform throughout the feeding trial. Milk yield was recorded at every milking. The range in CP (% DM) for MstS, MstD and CFM in three farms were respectively 5.77 to 6.10, 4.14 to 4.64 and 12.60 to 16.85. Similarly the ME (MJ/kg DM) varied from 7.29 to 8.41, 6.7 to 7.3 and 7.07 to 10.81.

The CFM constituted 37 to 62 per cent of total DMI in these farms. Regardless of the proportion of CFM in the diet, the MstS DMI was higher than the MstD DMI in all farms. MstS DM intake relative to MstD intake in MP-C, LP-C and MP-B were respectively 1.1, 1.23 and 1.16, and these were significantly higher (P < 0.006). The OMI (kg/d; MstS vs MstD; 12.27 vs 11.06 in MP; 8.89 vs 7.02 in LP-C and 11.70 vs 11.08 in MP-B) was significantly higher in MstS fed groups in MP-C (P=0.0001) and LP-C (P=0.001) and it was tending to be significant in MP-B (P=0.1111). The CP (kg/d; MstS vs MstD; 1.33 vs 1.18 in MP-C; 0.80 vs 0.62 in LP-C and 1.24 vs 1.07 in MP-B) and NDF (kg/d; MstS vs MstD; 7.91 vs 7.28 in MP-C; 6.06 vs 4.14 in LP-C and 7.64 vs 6.70 in MP-B) intakes were also significantly (P<0.03) higher in all the three farms for MstS fed groups when compared to MstD fed group.

The average daily milk yields (kg/d) before trial, MstS, MstD and MstS feeding ranged from 14.03±0.28 to 15.89±0.18 for MP-C, 4.92±1.17 to 6.04±1.50 for LP-C and 8.32±1.09 to 9.52±1.11 for MP-B farms. The 4 % FCM milk yields ranged from 13.90±0.13 to 17.80±0.02; 5.37±1.22 to 7.42±1.63 and 12.05±1.79 to 14.11±1.53. The difference between the MstS and MstD feeding periods was statistically significant for
milk yield (P<0.007) and 4% FCM yield (P<0.005) in MP-C but in LP-C, milk yield was similar, and 4% FCM yield differed (P<0.0031). The difference in average weekly LR between MstS and MstD groups were statistically significant in all three farms. The average milk total solids, milk fat, milk protein, milk lactose, SNF, ash and their respective yields (kg/d) were recorded. The results showed that the similar trend was observed as in the previous experiment.

**Conclusion:** The maize stover harvested soon after physiological maturity /grain harvest can be converted into silage of acceptable quality. Sun drying of maize stover affects its nutritional value. A higher DMI, higher milk production and better milk quality can be achieved by feeding MstS as compared to MstD. Therefore, conservation of maize stover as silage is a better option than in the conventional dry form. This can have a significant impact on resource utilization specially in mitigating fodder shortage during lean season.