DISCUSSION
DISCUSSION

The domestication of rabbit is shrouded in mystery. It is believed that the original site of domestication was Iberian Peninsula, the present Spain and Portugal. The first rabbit husbandry was recorded in the early Roman times when rabbits were kept within walled "rabbit garden". These rabbits reproduced within these garden enclosures and they were captured and used for food. During the middle ages, the rabbits were kept in the rock enclosures in England and some parts of eastern Europe.

The domestication of rabbit probably began in the 16th century in Monasteries. By 1700, seven distinct colours have been known to be selected: non-agouti, brown, albino, dilute blue, yellow, silver and Dutch spotting. By 1850, the two colours and probably the Angora type hair had been developed. Between this period and the present day many colours and fur type breeds have been selected leading to the pet breeds etc.

Rabbit rearing can be advantageously made a small scale endeavour as a few does can be kept easily on backyard scale by the women to produce enough meat to meet the needs of the family by simply using compound weeds, tropical forages, vegetable tops and table scraps as feed. Rabbit can act as a biorefrigerator since the meat of the animal can be consumed by the family without the need for refrigerating storage. The rabbits breed round the year, thus a continuous meat supply for the family and the neighbours can be made with just a few breeding animals. The high reproductive potential is of great importance and advantage for rabbitry in India.

Eventhough reproduction in rabbits is basically mammalian there are some differences that are peculiar to themselves. Since the estrous female does not exhibit true cycle, induced breeding at any time becomes possible unlike other mammals. Moreover the sexual maturity depends upon the breeds and nutritional factors although climate has a role to play. Therefore, it is always advantageous to study the reproduction of rabbits for economic breeding performances and productivity.
On studying the reproduction it was found that New-zealand white rabbit female attained maturity at the age of 6.78 ± 0.03 months and Soviet chinchilla rabbit at the age of 6.76 ± 0.03 months under Barapani rearing condition (Table 6). As such no significant difference could be observed between and within the puberty breeds maturity characteristic. Bujarbarua and Das (1994) and breeding age reported that the average maturity age of Newzealand white rabbit was 5.73 months and for Soviet chinchilla rabbit it was 6.1 months. Maturity at 5.56 months of age was also observed by Lahiri and Mahajan (1982) in Newzealand white rabbit. Therefore, the present result showed nearly one month delayed maturity in Newzealand white rabbit and about a fortnight delay in the maturity of Soviet chinchilla rabbits under Barapani rearing conditions. However in reproductive status of colony bred rabbit at Animal Research Laboratory of I.V.R.I., Narayan and Rawat (1983) reported 235.9 ± 2.77 day (approximately 7.8 months) for maturity of the same breeds which was one month more late than in the present study at Barapani. Therefore, Barapani ecoclimatic conditions appeared to be comparatively better for rabbit rearing than that of Uttar Pradesh.

The mating performance of the two breeds was also studied and it was observed that the number of matings per successful conception was 1.23 ± 0.04 for Newzealand white and 1.33 ± 0.04 for Soviet chinchilla rabbit (Table 9 and 9a) confirming thereby that more than one mating was required for successful conception. These observations were somewhat in agreement with Narayan and Rawat (1983) who reported 1.17 number of services per conception under Uttar Pradesh climatic conditions. Higher number of services per conception was reported by Bujarbarua et al (1989). They found that 1.80 ± 0.22 and 2.35 ± 0.15 services per conception was required for Newzealand white and Soviet chinchilla rabbit which was nearly in agreement with the present findings.

The number of successful matings was found to be comparatively higher in both the breeds in their first generation and the observation was in agreement with that of Rawat and Narayan (1982). But the present result was not in agreement with that of Narayan et al (1981), who reported that the average number of services per conception ranged between 1.29 to 4.13 number in different generations and that the majority of the
females conceived during the second service. The average number of services per successful conception was less in 2nd generation. Sittman et al (1964), Lampo et al (1975) and Narayan and Rawat (1982) had also reported that the fertility of rabbit was more in 2nd generation than in first generation. The present result showed that there was no significant difference of the mating trait between the breeds and generations. Therefore, it was obvious that under North East Indian conditions both the breed responded nearly equally upto the period of conception under the present breeding environment.

The wild rabbit doe makes her nest in a burrow in the ground. In the domestic rabbit, the nest box is a substitute for the burrow. The nest building behaviour of the doe, including the arrangement of the bedding in the nest box and pulling fur to make the nest was found to be an important component of the reproductive process of rabbit. The survival of the offspring and the caring ability of the Doe depends considerably on the quality of the nest built.

Nest building is an interesting characteristic of rabbit although under special circumstances they also breed without a nest. The survival status at weaning of the litter size showed that it was 2.00 ± 0.70 for Newzealand white and 1.00 ± 0.28 for Soviet chinchilla with no nest building situation compared to Nest performance litter size at weaning with nest building counterparts, where the litter size survivability was 4.97 ± 0.12 in Newzealand white and 5.03 ± 0.13 in Soviet chinchilla rabbits. Thus the survivability status at weaning was more with the rabbit groups that prepared the nest (Table 12), thereby showing positive benefits of nest building.

The nest building characteristics as per Admason (1959) was that the adult female rabbit pulled hair from their body to make nest above that of other materials to give safeguard to their newly born kits. Hudson and Diestal (1982) also reported that the pregnant Doe prepared the nest to take care of their kits. Similarly McNitt and Moody (Jr) (1987) reported that the rabbit Doe prepared the nest to nurse their kits in Newzealand white and Soviet chinchilla breed just after birth. The above observations were in agreement with the present observations made with Newzealand white and Soviet chinchilla rabbits.
Vange (1963), Zarrow et al (1965) and Damyanova et al (1989) reported that nest preparation at the time of delivery could be attributed to underground nesting habit which provided good protection for the young as long as the nest was not discovered by the predators. Infrequent brief visits by the doe reduced the chances of predators locating the nest. Canali et al (1991) also reported that the influence of nest was important for Newzealand white rabbit kits for effective survival.

The analysis of variance test between the nest building and without nest building impact on litter size at birth and weaning showed highly significant ($P < 0.01$) differences between without nest and with nest performing groups of Soviet chinchilla and Newzealand white rabbits. Szendro and Kustos (1988) in their investigation on Newzealand white and Californian rabbit reported a definite relationship between quantity of hair in nest box and mortality of the suckling kits. Therefore, it clearly signified that in both the breeds the nest building and survival performance was independently different from that of no nest building. So, survivability and economic rearing was significantly encouraging with nest building trait compared to the without nest building traits under Barapani eoclimatic conditions.

The gestation periods in the experimental breeds was studied to ascertain the specific status. It was found that the mean gestation period of Newzealand white and Soviet chinchilla rabbit was $30.8 \pm 0.05$ days and $30.88 \pm 0.05$ days respectively. Therefore it showed no difference of gestation period between the breeds (Table 15a).

However the gestation period in first and second generation in

Gestation period both the breeds of rabbit was also found to be similar. Thus the present results were found to be in agreement with Mishra (1990), Bujarbarua et al (1989) and Bujarbarua and Das (1994) who also reported no observable difference in period of gestation between Newzealand white and Soviet chinchilla rabbit. Similar result was also reported by El-Tawil et al (1971) on their work on gestation period in three different breeds of rabbits and their crosses. Sandford (1979) also reported observed similar results on domestic rabbits. Higher gestation (31-32 days) period was reported by Pickard (1930), Rosahn et al (1934), Hammond (1937) and Templeton (1939) in the medium breeds of rabbits. Mathius et al (1988) has reported to have observed 32 days gestation length in Newzealand white rabbit. The present observation showed no significant difference
between the breeds and so the present results were in agreement with the reports of Stalinski (1959) and Shawer (1963) in Giza white and Bouscat rabbits. Wilson and Doudly (1952) reported similar gestation periods in between pure breed and cross bred rabbits. Afifi and Emara (1985) working on Bauscat, Giza white, white flender, Baladi red and their crosses found that the pregnancy duration for pure breed was similar to that of cross bred rabbits.

Similar report in support of the present study was that of Mahajan and Shastry (1980) and Damodar and Jatkar (1985) who also worked on Newzealand white and Soviet chinchilla rabbits.

The present results were however not in agreement with Rosahn et al (1934) and Venge (1963) as they reported that the mean length of gestation period of purebreed rabbits was significantly (P < 0.05) different from cross bred rabbits. Similar results were also reported El-Tawil et al (1971) on purebreed and cross bred rabbits. McNitt and Moody (1991) reported a wide range of variation from 26 to 37 days of gestation period working at Louisiana, with medium breeds of rabbits.

The gestation period in first and second generation in Newzealand white rabbit was similar whereas in Soviet chinchilla rabbit, the first generation showed 0.10 days more time of gestation than the second generation. The gestation trait in kindling order for both the breeds was highest being 30.96 ± 0.11 days in Newzealand white and Soviet chinchilla rabbit in 1st kindling and the lowest was in the 2nd kindling being 30.73 ± 0.11 days in Newzealand white and Soviet chinchilla rabbit. The seasonal variation showed that it was longer, being 30.97 ± 0.10 days in 2nd (June to September) season and shortest (30.81 ± 0.13 days) in 3rd (October to November) season in Newzealand white and Soviet Chinchilla rabbits. The result thus showed no significant difference between the breeds, generation, kindling order and season of kindling which obviously confirmed that rearing economics in husbandry and management for both the breeds have no difference under Barapani ecoclimatic conditions.

The result on kindling order was in agreement with Rosahn et al (1935), Santoro and Hernandez (1967), El-Tawil et al (1971) and Afifi and Emara (1985) who reported that parity (Kindling order) did not influence gestation length of their rabbits significantly. However Pickard (1930) revealed that order of pregnancy affected the duration of gestation in purebreed rabbits. The results on seasons of kindling was not in
agreement with Afifi and Emara (1985) who reported that the season of kindling significantly affected the gestation period in Bouscat, Giza white, White flender and Baladi red breeds of rabbits.

The interkindling period has got definite economic significance in rabbit rearing. As the interkindling period reduces the number of generation increases, thereby, inducing higher productivity in the breeds concerned with higher margin of economic return. The result of interkindling period of Newzealand white and Soviet chinchilla rabbit showed that the mean period was 95.56 ± 1.96 days and 95.9 ± 2.98 days respectively. This indicated 0.34 day less in Soviet chinchilla compared to that of Newzealand white rabbit (Table 18 and 18a). However, the present results are not in agreement with that of Gecele et al (1983) who reported interkindling period of 44.08 ± 1 16.75 days in Newzealand white rabbit. Castelline and Panella (1987) reported 58.45 days of inter kindling period in Newzealand white rabbit.

But the present results are in partial agreement with that of Bujarbarua et al (1989) and Bujarbarua and Das (1996). In the present investigation the interkindling period was comparatively less (about 5 days) in second generation in both the breeds. The analysis of variance also showed that there was no significant difference in between breeds and generations in the interkindling period and hence it was in agreement with Bujarbarua et al (1989). The longer period of interkindling in the present rearing performance was probably influenced by the environmental conditions of Barapani which has an independent climatic regime compared to other rearing areas in Indian continent.

Litter size of rabbits is one of the most important factors in respect of productivity of does and economics of rearing. The larger the number of young ones the doe kindles the greater is the likelihood of profitability in rabbit rearing. Considering the importance of the litter size at birth in regard to adaptive character and nutritional status of the breeding doe and the economics of rearing, the observations have been recorded in regard to the breed performance. The observation showed that the litter size at birth of Newzealand white and Soviet chinchilla rabbits were 6.19 ± 0.15 and 5.92 ±
0.16 numbers respectively (Table 21 and 21a). But in both the breeds the litter size at birth was found to be slightly higher in second generation

**Litter size at birth** (Newzealand white 6.30 ± 0.23 and Soviet chinchilla rabbit 6.03 ± 0.22). This result was in agreement with that of Sartika and Diwyanto (1985), Gupta (1987), Bhasin et al (1989) who working on Newzealand white, Grey giant and Soviet chinchilla rabbits respectively reported observing the same trends. Similar results of 6.0 ± 0.8 and 5.0 ± 0.7 litter size at birth was reported by Testik (1996) in Newzealand white and Soviet chinchilla rabbits respectively.

Afifi and Emara (1987) also reported that the overall mean litter size was 6.29 young ones at birth for 513 litters observed representing Bouscat, Giza white, Flender, Baladi red and their crosses.


Miroshuichenko (1984) after studying four successive generations of Soviet chinchilla rabbits found that the litter size at birth was 8.2, 9.2, 9.0 and 8.0 which were comparatively higher than the present observations.

Lower litter size at birth in Newzealand white and Soviet chinchilla rabbit compared to the present work was reported by Narayan et al (1978 b), Rawat and Narayan (1980), Damoodar and Jatkar (1985) and Mishra (1989) with 4.04 to 5.34 young ones per litter.

The litter size at birth in both the breeds was highest in IIInd kindling being 6.34 ± 0.3 young ones for Newzealand white and 6.07 ± 0.33 for Soviet chinchilla rabbit respectively and in both the breeds the litter trait was lowest in IIIrd kindling with 5.96 ± 0.34 young ones for Newzealand white and 5.69 ± 0.35 young ones for Soviet chinchilla rabbit.

The litter size at birth during seasons of kindling was found highest during December to February (4th season) and it was lowest during October to November (3rd season). Analysis of variance revealed no significant differences in litter size between
breeds, generations, kindling order and seasons of kindling. The present result showed that there was no significant differences in between breeds in their litter size which was in agreement with the observation of Bujarbarua et al (1989), Patial et al (1977) and Bujarbarua and Das (1996). However, difference of litter size due to breeds has been reported by Hattenhauer et al (1977), Lahiri and Mahajan (1984) and Hassan and Owolabi (1996), but this trait could not be confirmed in the present investigation.

The present result on kindling order and season of kindling was in agreement with Afifi et al (1976), Khalil (1980), Emara (1982), Lukefahr et al (1983 c) and Khalil et al (1987). However it was not in agreement with McNitt and Lukefahr (1985). Seasonal variation of Newzealand white rabbit in the litter size was reported by Sittman et al (1964) supporting the present observation.

The litter weight at birth is also an important character in rabbit husbandry as it determines the health status of the kits and their survivality in the rearing process. The litter weight at birth for Newzealand white rabbit in the present investigation was 321.69 ± 9.24 g and in Soviet chinchilla rabbit it was 284.28 ± 9.67 g (Table 21 and 21 b). The result obtained on Newzealand white rabbit was in agreement with Damodar and Jatkar (1985) who reported 327.39 g birth weight in Newzealand white and Grey giant rabbits. However the litter weight obtained in Soviet Chinchilla was comparatively lower.

Higher litter weight was reported by Lahiri and Mahajan (1983) with 345.2 ± 0.349 g for Newzealand white and 407.0 ± 0.53 g for Soviet chinchilla rabbit. Magheri et al (1982) observed the litter weight at birth as 425.90 g in medium breed rabbit.

The least square mean showed that the litter weight was higher in second generation and analysis of variance showed significant difference (P < 0.05) in litter weight gain between the breeds. Similar result was reported to be observed by Bujarbarua and Das (1996). Templeton and Kellog (1984), Mahajan and Shastry (1980) and Damoodar and Jatkar (1985) were also in support of the present findings.

Lahiri and Mahajan (1984) reported higher litter weight in Soviet chinchilla rabbits in comparison to other breeds of rabbit and the findings were similar to CSWRI Report (1993). Greater the body weight lesser the litter size was reported by Rouvier et al (1973) Zicarelli and Lela (1974), Broeck et al (1975) and Narayan and Rawat (1982).
In kindling order the least square mean showed highest weight gain in IIIrd kindling being 330.46 ± 20.96 g in Newzealand white and 303.11 ± 21.58 g in Soviet chinchilla rabbit and lowest body weight gain was in 1st kindling order in both the breeds.

In season of kindling the highest litter weight in both the breeds was observed during December to February (4th season) being 336.43 ± 19.85 g for Newzealand white and 309.08 ± 19.85 g for Soviet chinchilla rabbits. However, the analysis of variance showed no significant difference between body weight gain in different generations, kindling order and the seasons of kindling. Moreover the result was not in agreement with Afifi et al (1976 a & b), Afifi and Emara (1986 a & b), Khalil et al (1987) and Khalil and Monsour (1987) who reported significant differences in litter weight in between the different year and seasons of kindling working on four pure Egyptian breed of rabbits.

Therefore, it was obvious that under the Barapani rearing conditions there was no significant difference in the litter weight gain at birth between the Newzealand white and Soviet chinchilla rabbit breeds’ rearing performance in terms of generations, kindling order and seasons of kindling.

The litter size at weaning basically determines the survival status of the breeds under specific environmental rearing conditions and adaptive efficiency of the breeds. In the present work the gross mean litter size at weaning in Newzealand white and Soviet chinchilla rabbit was 4.81 ± 0.11 and 4.48 ± 0.13 number of kits respectively (Table 24 and 24a). This result was in agreement with Afifi and Emara Litter size at weaning (1987) who reported on working on Egyptian rabbits and Bujarbarua and Das (1994) reported working on Newzealand white and Soviet chinchilla rabbits under Indian conditions.

Higher litter size than the present study was reported by Paufler et al (1979) in Newzealand white and White Termonde rabbits and Lahiri and Mahajan (1982) in Newzealand white rabbit reporting the range from 5.1 to 5.9 kits. This difference was probably due to climatic variations.

Lower litter size average in comparison to present study of 4.22 kits per litter was reported by Hattenhouer et al (1977).
The result obtained in the present investigation showed no difference of litter size at weaning in between the two breeds and the result was in agreement with Sartika and Diwyanto (1985), Patial et al (1991) and Bujarbarua and Das (1996). However, differences due to breed \( P < 0.05 \) had been reported by Afifi et al (1976 a & b and 1982 a & b); Afifi and Emara (1985 and 1986 a & b) in their work on four Egyptian pure breeds of rabbits.

The litter size at weaning was highest in first generation, being \( 4.91 \pm 0.18 \) kits in Newzealand white and Soviet chinchilla rabbits respectively and was lowest in second generation. In 1st kindling order the litter size was highest in kindling being 5.14 ± 0.27 in Newzealand white and 5.18 ± 0.28 in Soviet chinchilla rabbits. During season of kindling the litter size was highest in kindling being 5.14 ± 0.27 in Newzealand white and 5.18 ± 0.28 in Soviet chinchilla rabbits. During season of kindling the litter size at weaning was highest in 3rd (October to November) season being 5.12 ± 0.31 in Newzealand white and 5.16 ± 0.34 kits in Soviet chinchilla rabbit. This trait was lowest in both the breeds during December to February (4th season). The analysis of variance (Table 25) showed that there was no significant difference of trait in between generation, kindling order and season of kindling which confirmed that both the breeds survived under the agroclimatic condition of Barapani.

The least square mean of the litter weight at weaning showed that Newzealand white rabbit attained 3512.54 ± 89.65 g and Soviet chinchilla rabbit attained 3524.94 ± 92.28 g (Table 24 and 24 b). Lahiri and Mahajan (1984), Castelline and Panella (1987) also recorded higher litter weight for Soviet chinchilla rabbit in comparison to other breeds of rabbit. Gupta at (1987) recorded little higher weaning weight in Soviet chinchilla rabbit in comparison to Newzealand white rabbit (3.42 Vs. 3.32 kg.), which was in support of the present study. Higher body weight in Soviet chinchilla rabbit was also recorded by Bujarbarua and Das (1994).

Analysis of variance test on litter weight showed no significant difference between the two breeds (Table 25). Afifi et al (1976 b), Lahiri and Mahajan (1983) recorded significant difference between the two breeds. Bujarbarua and Das (1996) also observed significantly higher body weight in Newzealand white (3.82 ± 0.09 g) in comparison to Soviet chinchilla (3.51 ± 0.11 g) rabbits. Higher litter weight in
Newzealand white in comparison to present work was recorded by Lahiri and Mahajan (1982) as 3.92 ± 0.08 g.

During generation of kindling, for both the breed, litter weight at weaning was higher in 2nd generation (3809.81 ± 128.08 g in Newzealand white and 3822.21 ± 129.96 g in Soviet chinchilla) in comparison to 1st generation kits (3215.27 ± 126.67 g in Newzealand white against 3227.67 ± 129.95 g in Soviet chinchilla rabbit which showed significant difference (P < 0.01) between the generation.

During kindling order, the litter weight at weaning was highest (3641.82 ± 190.11 g in Newzealand white rabbit against 3654.22 ± 196.99 g in Soviet chinchilla rabbit) in 1st kindling order. The litter weight at weaning was lowest in both the breeds in 4th kindling order. Analysis of variance showed no significant difference between the kindling order. But significant difference of litter weight at weaning was recorded in kindling order by Castelline and Panella (1987) which was not in agreement with present study.

During season of kindling, the weight at weaning for both the breed was highest to the kits born in 3rd (October to November) season. It was 3915.37 ± 240.86 g in Soviet chinchilla rabbit against 3902.97 ± 216.90 g in Newzealand white rabbits, and lowest to the kits born in 2nd (June to September) season. Analysis of variance also showed significant difference (P<0.05) between the season of kindling (Table 25).

Bhasin et al (1989) found that the reproductive performance trait was highest to the kits born in November, which was partially in support of the present study. Moura et al (1991) reported that month or season of birth and parity were the most important environmental factors influencing litter weight at weaning.

Leplage (1970), Rodellar et al (1991) recorded that seasonal affect was significant for weaning weight trait (P < 0.05). They observed the trait was increased between October to April in comparison to May and September, which was partially in support of the present study. Again Rodellar et al (1991) reported that seasonal effect may change from year to year and the results obtained in one period could not be generalised for other periods.

The litter survivability in Newzealand white and Soviet chinchilla rabbit upto weaning was found to be 80.11 ± 2.28 and 83.71 ± 1.29 percent (Table 26). Similar
results were obtained by Grobner et al (1985), who reported to have found 83 percent survivability of New Zealand white rabbit.

**Litter survivability**

Nearly 62.1 to 84 percent of survivability in different breeds of rabbit was recorded by Afifi and Emara (1986 a and b) and Khalil and Monsour (1987). Similar result of 82.4 percent survivability was reported in 50-60 g birth weight of rabbit by Morisse (1987).

In both the breeds, the survivability percentage was more in first generation compared to second generation. The survival percentage in New Zealand white rabbit was more 83.63 ± 5.71 and 83.53 ± 4.44 percent in 1st (March to May) and 2nd (June to September) season, whereas in Soviet chinchilla rabbit survival percentage (88.75 ± 0.99) was more to the kits born in 3rd (October to November) season.

However, the analysis of variance test (Table 27) showed no significant difference in between breeds, generation and season. The result was in agreement with Khalil and Monsour (1987), who found no significant difference of better survivability on the effect of season of Giza white rabbit.

The body weight at birth is the basic indication of the health of the rabbit under rearing conditions in a particular habitat. Because it gives an idea of nutrition and environmental health upon which the success of rearing depends. In the present investigation under Barapani environmental conditions, the body weight for New Zealand white and Soviet chinchilla rabbit were estimated and was found to be 52.74 ± 0.53 g and 50.58 ± 0.53 g respectively which confirmed that the New Zealand white attained better body weight (2.44 g more) at birth under Barapani environmental condition as compared to Soviet chinchilla kits (Table 28).

Nearly similar body weight (52.96 ± 0.16 g) for New Zealand white rabbit was observed by Lahiri and Mahajan (1981). This observation was supported by the works of El-Khisin et al (1951); Ragab et al (1952); Ragab and Wanas (1960) and Afifi et al (1985), who reported nearly 15 g body weight differences in between two Egyptian...
breeds compared to our 2.44 g of difference between the Newzealand white and Soviet chinchilla breeds in Barapani, Meghalaya. The birth weight variation between Egyptian breed from 50.49 ± 0.74 g to 52.83 ± 0.74 g was also reported by Afifi et al (1973), Testik (1996) working in Turkey reported that the performance of Newzealand white was better in comparison to Soviet chinchilla rabbit.

However, slightly heavier body weight of kits at birth was reported in subtropical conditions (53.19 to 58.21 g) in Soviet chinchilla and Newzealand white by Gupta et al (1992). Similar observation of variations (53.0 g to 67.6 g) was also reported from other countries by Johnson and Vange (1953), Zelnik and Granat (1970 and 1973), Aleksandrov et al (1979) and Szendro and Barna (1984), Grobner et al (1985) observed 55.09 g as birth weight in Newzealand white in comparison to Palmoni breed (54.2 g).

Female kits showed higher body weight (1.32 g more) than the male kits in both the breeds, thereby confirming that at birth the female body weight was comparatively higher in both the breeds as obtained in the present investigation at Barapani. The birth weight in the subsequent generation was also recorded and analysed and was found to be nearly similar with marginal improvement in second generation in both the breeds. The individual body weight during the season of kindling was found to be highest during 3rd (October to November) season and it was lowest in 2nd (June to September) season in both the breeds and their differences were highly significant (P < 0.01) thereby confirming independent growth traits and adaptability between the breeds and seasons of kindling (Table 30). These findings were also in agreement with Afifi et al (1973, 1982 a and 1985), Yapparov (1978), Lukefahr et al (1984) who worked on birth weight of kits in different breeds of rabbits and their crosses with significant (P < 0.05 or P < 0.01) group and breed differences.
The individual body weight at weaning can be considered a positive indication of adaptation of the breeds to the environment and success of rearing. The body weight at birth was found more in Newzealand white rabbit whereas at weaning, the body weight gain was found higher in Soviet chinchilla rabbit being 726.71 ± 6.43 g compared to 723.59 ± 6.40 g in Newzealand white rabbit (Table 29 and 29 b). This observation showed that the growth performance of Soviet chinchilla was comparatively better than that of Newzealand white rabbit by 3.2 g under Barapani rearing conditions.

But this result was found not in agreement with Gupta et al (1986) and Bujarbaruah and Das (1996) who reported that the weight gain was more in Newzealand white compared to Soviet chinchilla rabbit.

But the present results were in partial agreement with Lahiri and Mahajan (1982) who recorded higher weight gain by Soviet chinchilla rabbit. The present findings were however similar to CSWRI Report (1993).

In both the breeds the males were found to possess 25.88 g more body weight than that of females showing that the males grew faster than the females under Barapani rearing conditions and this result was in agreement with Bujarbaruah and Das (1994) as they reported that the males were heavier than the females in both Newzealand white and Soviet chinchilla rabbits in rearing experiments. This result was also in agreement with Lahiri and Mahajan (1993) who reported significant differences (P < 0.01) in different genetic groups as well as to that of Bujarbaruah and Das (1994) who reported that growth differed significantly in sex under their rearing conditions.

The second generation kits were found to grow heavier than the first generation kits which indicated that with the subsequent generation the performance was better in both the breeds (99.46 g more) probably due to their good adaptation to the present rearing conditions. The individual body weight gain at weaning was highest during the 3rd (October to November) season in both the breeds being 758.38 ± 13.87 g in Newzealand white and 761.50 ± 16.37 g in Soviet chinchilla rabbits. The weight gain was found lowest being 692.55 ± 11.37 g in Newzealand white and 695.67 ± 11.51 g in Soviet chinchilla rabbit in the 2nd (June to September) season. This further confirmed
that the seasonal responses were also similar in both the breeds under Barapani conditions.

The analysis of variance (Table 30) revealed no significant difference in between the individual weaning weight in between the breeds. However, the synchronised growth performance was not in agreement with that of Lahiri and Mahajan (1983) and Affii et al (1987) who reported that litter weight at weaning was significantly affected by breeds.

Therefore, compared to the performance reported from other areas of the country, the rearing performance of these two breeds of rabbits under Barapani rearing conditions of the North Eastern India appeared to be more encouraging and economically satisfactory.

The growth in terms of body weight gain by kits was studied upto 90 days as the body weight gain at 90 days was an important factor for rearing of rabbits. Because this was the best time for slaughtering them for commercial meat. The present study on Soviet chinchilla rabbit weight at 90 days showed gaining body weight by 1657.47 ± 10.06 g in comparison to Newzealand white rabbits body weight gain 1627.83 ± 8.37 g (Table 30). This weight at 90 days clearly indicated that the Soviet chinchilla rabbit could gain comparatively higher body weight than Newzealand white rabbit at 90 days. The growth performance was in agreement with that of ICAR Complex Annual report (1991, 1992 and 1993). However, these results were found to have slightly differed with that of Bujarbaruah and Das (1994 and 1996) in terms of body weight gain superiority, as they found the Newzealand white rabbit's growth was superior to Soviet chinchilla rabbit, in relation to the total body weight gain under Barapani rearing conditions. Similar result of superiority in Newzealand white rabbit was observed in Nagpur by Nagpure et al (1991) who recorded 1384.81 ± 74.49 g in comparison to Soviet chinchilla's body weight of 1371.59 ± 44.15 g.

Further it was clearly observed that in both the breeds the males were heavier than females nearly by 1.6 percent (Fig. 5) which confirmed that the males grow faster than the female in terms of fryer body weight. The present findings were in agreement with the findings of Bujarbaruah and Das (1994).
The generation growth performance showed that the body weight gain was comparatively more in second generation in both the breeds and also during the seasons of kindling. The highest weight gain was in 3rd (October to November) season in both the breeds being 1662.72 ± 20.7 g in Newzealand white and 1698.55 ± 22.57 g in Soviet chinchilla rabbit thereby showing 4.1 percent gain over the 2nd (June to September) season. These results showed that the fryer body weight gain was significantly (P < 0.01) different in between breeds, generation and season of kindlings. The results were in agreement with Gupta et al (1990) who observed significant difference in body weight gain at 90 days among breeds, working on Newzealand white Soviet chinchilla Grey giant and White giant. The result of significant difference between the breeds was not in agreement with the result of Nagpure et al (1991). However, in both the breeds, though the males were apparently heavier than the females yet their body weight gain was not significantly different. Therefore, there was no growth difference between the breeds under the Barapani rearing conditions.

The growth performance of kits for commercial reasons was followed up to 120 days and the result showed that the Newzealand white attained a body weight of 2194.9 ± 10.9 g compared to that of Soviet chinchilla body weight of 2168.45 ± 12.9 g at 120 days (Table 33). These results further showed that the total performance of Newzealand white was superior to Soviet chinchilla under Barapani rearing conditions.

The result was also in agreement with Bujarbaruah and Das (1994 and 1996). In both the breeds, as usual, the males were heavier than the females by about 33.66 g.

Moreover, the rabbits born in the second generation was heavier by 30.46 g in both the breeds than those born in the first generation (Table 34 and 34a) under Barapani rearing condition. Similar result of higher body weight gain was reported by Miroshuichenko (1984) who found body weight of 3.02 kg, 2.98 kg, 2.93 kg and 3.05 kg at 120 days of age in first, second, third and fourth generations respectively in Soviet chinchilla rabbit.

The performance in the seasons of kindling was found highest in the 3rd (October to November) seasons in both the breeds as the weight gain was 2230.65 ± 25.25 g in Newzealand white and 2208.66 ± 27.99 g in Soviet chinchilla rabbits. The lowest body weight gain was obtained in 2nd (June to September) season of kindling.
with weight gain of 2168.05 ± 20.86 g in Newzealand white and 2146.06 ± 20.78 g in Soviet chinchilla rabbit (Table 34a). The result showed further that there was significant differences (P < 0.05) in between the sexes in both the breeds as the males were having higher body weight compared to the females. So it could be assumed that both the breeds performed nearly equally at 120 days rearing under the Barapani eco-climatic conditions.

The rearing was further continued for experimental reasons upto 180 days to ascertain the growth performance. It was found that individual body weight gain at 180 days for Newzealand white and Soviet chinchilla rabbits were 2770.04 ± 11.90 g and 2570.65 ± 12.20 g respectively .The growth body performance depicted a higher body weight gain by Newzealand white compared to that of Soviet chinchilla rabbit (Table 33) and the findings were in agreement with Bujarbarua and Das (1994 and 1996) and Testik (1996) who reported, working on Newzealand white and Soviet chinchilla rabbit. Lower body weight gain than the present study was observed by Nagpure et al (1991) working on pure breed and cross breed rabbits recording 2337.50 ± 100.77 g in Newzealand white and 2362.50 ± 31.46 g in Soviet chinchilla rabbit.

As usual the males were heavier than females in both the breeds by 54.82 g (Table 34b). In both the breeds the second generation rabbits were found to attain a little higher body weight gain by 9.07 g over the first generation rabbits.

The seasons of kindling showed that the weight was highest, being 2822.80 ± 28.79 g in 3rd (October to November) season in Newzealand white and lowest in the 2nd season being 2748.92 ± 21.51 g. In Soviet chinchilla rabbit also the body weight gain was highest in 3rd season being 2624.44 ± 28.57 g and it was lowest, being 2550.56 ± 22.15 g in 2nd season (Table 34 b). This clearly indicated that the rabbit born in between October to November was best for fattening under Barapani rearing conditions. The weight gain at 180 days was found to be significant (P < 0.01) between the breeds and sexes, which was in agreement with Nagpure et al (1991). The result was also significantly different (P < 0.05) in between seasons of kindling but no difference
was found in between generation for both the breeds under eco-climatic condition of Barapani.

Pre weaning body weight gain is an economically important trait requiring particular attention in any rabbitry scheme, since it is influenced by the maternal factors. The growth of rabbit breeds reared under Barapani eco-climatic conditions have been followed up to pre-weaning stage to ascertain rabbitry’s commercial viability. The pre-weaning growth is usually influenced by the maternal factors like litter size, doe's milk yield and its health and nursing ability. This is because the litter start eating feed and fodder after 30 to 35 days of age only.

The recorded body weight gain by kits per day was 14.91 ± 0.10 g for Newzealand white and 15.03 ± 0.14 g for Soviet chinchilla rabbit (Table 37 and 37a). This observation confirmed that the growth in Soviet chinchilla rabbit was comparatively better that that of Newzealand white rabbit by 0.12 g per day in terms of body weight gain. Similar body weight gain in Soviet chinchilla rabbit was reported by Bujarbarua and Das (1996).

Lower growth rate of 3 to 12 g weight gain per day was recorded in various breeds of rabbits by Shafie et al (1961) and Chiang et al (1982), whereas, 10 to 20 g per day body weight gain in Newzealand white rabbit was recorded by Omle (1977), Echiett et al (1980), Magheni et al (1982) and Olukun (1985). Khalil and Khalil (1991) recorded 11 ± 0.5 and 10 ± 0.5 g per-weaning body weight gain in Bouscat and Giza white rabbit.

Working on Newzealand white and Soviet chinchilla rabbit Lahiri and Mahajan (1983) and Damoodar and Jatkar (1985) reported the pre-weaning body weight gain of 20 g and 23.35 g respectively. Whereas Bujarbarua and Das (1994) reported 12.18 and 12.9 g pre weaning body weight gain for Newzealand white and Soviet chinchilla rabbit respectively.

In both the breeds pre weaning body weight gain was higher for male being 15.27 ± 0.14 g in comparison to female 14.66 ± 0.14 g. This showed about 0.61 g better weight gain per day by males. However, in both the breeds the second generation kits were found to be gaining 2.21 g per day more weight than the first generation kits (Table 37a).
The seasons of kindling showed that the 3rd (October to November) season born kits of New Zealand white gained body weight of 15.59 ± 0.30 g and 15.71 ± 0.36 g. Weight gain was for Soviet chinchilla rabbit kits. The lowest body weight gain per day was 14.28 ± 0.25 g and 14.40 ± 0.25 g in New Zealand white and Soviet chinchilla rabbit kits born in 2nd (June to September) season. The result of analysis of variance depicted that the body weight gain was not significantly different in between the breeds. But the preweaning body weight gain was significantly (P < 0.01) different in between the sexes, generations and seasons.

The result was also in agreement with Ragab and Wani (1960), Afifi et al (1985 and 1987). While working with Egyptian breed they found that month of birth's effect was of some important in influencing (P < 0.01) preweaning body weight gain of rabbits. Vange (1965) and Lukefahr et al (a) also reported that preweaning growth was influenced by month of kindling and generation. The result was also in agreement with Khalil and Khalil (1991) who reported significant differences (P < 0.01) on preweaning body weight gain in different generations and seasons in two breeds of rabbits and confirmed that the season of birth was one of the most important non genetic factors influencing preweaning body weight gain.

Postweaning body weight gain up to 90 days of age is an important factor in rabbit husbandry as it influences the number of rabbits that can be used in selection programme for increasing productive efficiency of the group. This also influences the commercial profit efficiency of the rabbitry. The performance at postweaning stage was studied and found that the mean postweaning body weight gain was 19.97 ± 0.15 g and 20.69 ± 0.14 g per day in New Zealand white and Soviet chinchilla rabbits (Table 37b) respectively.

Both the breeds showed that the average body weight gain was from 20 to 21 g per day compared to 20 to 25 g per day observed by Chapin and Smith (1967), Adams (1976), Chen et al (1978) and Martina and Damian (1981 a) on New Zealand White rabbit in European countries. Higher body weight gain at postweaning period by 27.0 to 33.1 g per day was observed by Mathius et al (1988) on New Zealand white rabbit.

Similar results were also reported in India on New Zealand white rabbit by Mahajan et al (1880) and Reddy et al (1977) working on the same breed. The higher
weight gain by 25 to 30 g per day in European countries was reported by Chiericato and Lenari (1972), Bendacz and Frindit (1978), and Fekete and Hegedus (1986). Higher than this body weight gain at post weaning period (27.0 to 33.1 g per day) was reported by Mathius et al (1988) on Newzealand white rabbit. Cheeke (1980) found in United States and Europe that the rabbit in commercial rabbitries exhibit higher growth rate of 35 to 40 g per day in fryer stage to reach market age in 8 to 10 weeks. But in tropical countries the growth rate was found comparatively of lower range being 10 to 20 g per day with a corresponding longer period to reach slaughter weight. This observation agreed with our present raring performance at Barapani. He further stated that rabbit attained rapid maturity compared to other livestock in the same environment. This was also in agreement with the result of our present investigation. Ponce (1996) found and reported 17.5 ± 0.1 g and 19.2 ± 0.2 g daily body weight gain by rearing Newzealand white and Soviet chinchilla in Cuba.

The post weaning daily gain in body weight was found to be significantly different (P < 0.01) in between breeds. However the present performance was in agreement with El-Bendry (1961), Tetarev (1964), Nossair (1970), Afifi (1971), El-Quen (1988) and Afifi and Emara (1990) who reported that breed group differs significantly (P < 0.05 and P < 0.01) in post weaning body weight gain and constitute an important source of variation in weight gain and growth in rabbits. But the present results were not in agreement with El-Maghawry (1993) who found that the average daily body weight gain during post weaning period was similar in between Newzealand white and Californian breeds.

In both Newzealand white and Soviet chinchilla rabbit, it was found that the weight gain was almost similar in male and female. The weight gain in Newzealand white was 19.87 ± 0.22 per day male and 20.07 ± 0.22 g per day in female, where as in Soviet chinchilla rabbit it was 20.59 ± 0.20 g per day in male and 20.79 ± 0.20 g per day in female (Table 37 b). The sex growth performance indicated that the growth attainment was not significantly different between sexes. Similar results were reported by Shawer (1963), El-Bendry (1967, Afifi et al (1973), El-Sayed (1980) Khalil (1980), El-Quen (1988) by collecting data from Busacat, Giza white, white Flander and Baladi red rabbits. Mahajan et al (1980) also reported similar results with Newzealand white, Soviet chinchilla and Grey giant rabbits. They observed that the difference between
sexes in their average daily body weight gain during post weaning age was very small and not significantly different, thereby indicating that sex had almost no effect on post weaning daily body weight gain. El-Maghawy (1993) analysed the data of 3706 New Zealand white and Californian white rabbits and reported that the daily body weight gain difference between the sexes was very small and mostly not significant which extensively supported the present findings.

The generationwise growth rate in both the breeds showed that the daily growth was higher in first generation by 0.60 g compared to the second generation daily weight gain. The present findings further showed that the post weaning daily body weight gain was significantly different ($P < 0.01$) in between generation. This finding was almost in agreement with Afifi and Emara (1990) who also reported that the average daily body weight gain during the post weaning stage was significantly ($P < 0.05$ or $P < 0.01$) different in different breeds and with year of birth. The difference due to year of birth might be due to annual changes in climate feedings etc. conditions which might have been variable from one to another year. The result was also in accordance with El-Maghawry (1993) who had reported that effect of year was significantly different.

The season of kindling weight gain was almost similar in both the breeds, although the weight gain was little higher in kits born in 2nd (June September) season, but the growth was not found to be significantly different between the season of the study under Barapani ecoclimatic conditions. This result was not in agreement with El-Maghawry (1993) who had reported that the post weaning body weight gain during the kindling seasons was significantly different.

The cumulative body weight gain at 48 days was highest, being $824.00 \pm 44.26$ g and $721.00 \pm 18.87$ g in D5 (22 percent protein) diets for New Zealand white and Soviet chinchilla rabbit respectively (Table 39 and 40) and in both the breeds it was lowest in D1 (14 percent protein) diets. The average daily body weight gain for New Zealand white rabbit was highest ($19.62 \pm 1.05$ g per day) with 22 percent (D5) protein diet followed by $19.52 \pm 0.32$ g body weight when fed with 20 percent (D4) protein diets thus there was no significant difference in daily body weight gain when fed with 20 or 22 percent protein diet. The lowest body weight gain was observed when New Zealand white rabbits were fed with 14
percent protein in their diets. Similarly in Soviet chinchilla rabbit the average daily body weight gain was highest, being $17.17 \pm 0.45$ g per day when fed with 22 percent protein diets (D5) and showed no significant difference when fed with 20 or 22 percent (D4 & D5) protein diets and lowest body weight gain was observed when fed with 14 (D1) percent protein diets.

The higher growth at higher percentage protein level was in agreement with Omle (1977) who reported that when Newzealand white rabbit was fed with low (14%), medium (18%) and high (22%) protein diets and the growth rate was superior with 22 percent protein diets. De Blas et al (1986) found that significant differences in growth rate was observed with different protein and fibre levels and the finding was in agreement with the present results.

In this study no significant effect of growth rate was observed when fed with 20 or 22 percent protein diets and the finding was in agreement with the report of Sanchez et al (1985) and Zaghini and Lambertini (1987). The significant higher growth rate observed in high protein diet was also in agreement with the report of Butcher et al (1981 and 1983). It was also in agreement with Rao et al (1986), who indicated that 16 to 19 percent protein in diet was not enough for growth purpose in Russian Grey giant bunnies.

Higher protein level (21 to 22 percent) in diet seems to be suitable for growth of rabbit as reported by Cheeke and Patton (1978), Pote et al (1980) and Haris et al (1982). Deshmukh and Pathak (1991) observed similar results of higher growth in Newzealand white rabbit by feeding them with higher protein in their diets.

The growth rate performance in lower protein level in comparison to the present study was observed by Smith et al (1960) who found that the protein requirement for fattening Newzealand white rabbit was 13 to 14 percent, whereas 12 percent dietary protein was an optimal level for growth by Chiang et al (1982). The N.R.C. (1977) had recommended 16 percent crude protein for growth in rabbit. Spreadburry and Davidson (1978) found a level of 16 percent protein as optimum for growth of rabbits. About 15 to 16 percent protein was found suitable for growth of rabbit by Omle (1982), Lang (1981), Fekete and Gippert (1985) and Lebas (1988). Cheeke et al (1985) reported that 17.5 percent crude protein gave satisfactory reproductive performance and growth of

As expected, the intake of protein (g per day) increased with the increase in dietary protein level. In Newzealand white rabbit, the protein intake was highest (16.89 ± 0.32 g per day) in D5 (22 percent) diet and lowest (11.54 ± 0.22 g) in D1 (14 percent protein) diet and showed significant growth differences (P < 0.05) in between all groups of diets. In Soviet chinchilla rabbit the highest protein intake was 15.86 ± 0.66 g per day with D5 (22 percent protein) diets and lowest protein intake was 9.72 ± 0.54 g per day with D1 (14 percent protein) diets but showed no significant differences in between D4 and D5 and, D2 and D3 diets performance.

The result was in agreement with Smith et al (1960) who observed 9.4 g per day protein intake in Newzealand white rabbit when fed with 13-14 percent crude protein.

The feed intake (g per day) was highest (86.05 ± 1.52 g and 86.00 ± 1.62 g) in D4 (20 percent protein) and D5 (22 percent protein) diets respectively for Newzealand white rabbit and it was lowest in D2 (16 percent protein) diets. However, in Soviet chinchilla rabbit the highest feed intake was in D4 (20 percent protein) and lowest was in D1 (14 percent protein) diets. The result showed that feed intake was higher in high protein group in comparison to low protein group. The overall feed intake by different group was similar to the report of Omle (1977), Eschiett et al (1980), Omle et al (1982), and Deshmukh (1989). However, the result was lower than observed by Omle and Ajayi (1976), Battaglini (1979), Pote et al (1980), Champe and Maurice (1983), Raharjo et al (1986 a) and Lebas and Ouhayoun (1987).

The dry matter intake was higher in low protein diet D1 (14 percent protein) diet in Newzealand white rabbit. However, the dry matter intake was not effected significantly with the increase of protein level from 16 to 22 percent. But in Soviet chinchilla rabbit the dry matter intake was not at all affected by the increase of protein level in the diets. However, maximum dry matter intake (74.66 ± 0.96 g per day) was recorded under D4 (20 percent protein) diets and minimum under D3 (66.76 ± 0.90 g per day) diets in Soviet Chinchilla rabbits. The result depicted that the dietary protein level did not show any significant effect on the dry matter intake in the Soviet chinchilla rabbit (Table 39 and 40).
The result obtained in Soviet chinchilla rabbit was comparable to the values reported by Adegbola et al (1985) and Abou-Ashour and Ahmed (1986). The result observed in Newzealand white was partially in agreement with Spreadbury and Davidson (1978), Lebas (1983), Shastry and Mahajan (1982), Butcher et al (1983), Reddy and Reddy (1985) and Payne et al (1988).

The feed conversion efficiency was highest (4.38 ± 0.18 g and 4.70 ± 0.27 g) in Newzealand white and Soviet chinchilla rabbit when fed with D5 diets and lowest, being 6.47 ± 0.61 g and 6.83 ± 1.12 g for Newzealand white and Soviet chinchilla rabbit when fed with D1 diets. There was no significant difference in both the breeds of rabbit fed with D3 and D5 diets. However, significant difference (P < 0.05) was observed in lower protein group. The result confirmed that increase of protein in diets increases the feed conversion efficiency in both the breeds of rabbit in this investigation.

The result was in agreement with Bradfield and Mynard (1958), Chapin and Smith (1967), King (1978), Pedron et al (1980), Shastry and Mahajan (1982), Bouno et al (1982) and Deshmukh (1989). However, higher feed conversion efficiency than the present study was observed by Omle and Ajayi (1976), Martina and Damian (1981 a) and Oloukum (1985). Higher feed conversion efficiency of 4.48 to 5.18 g was observed by Parigi et al (1992) by working in Italy on commercial hybrid rabbits.

The consumable yield as dressing percentage was 54.1 ± 0.31 percent for Newzealand white rabbit against live body weight of 1908.33 ± 52.89 g. The consumable yield was 55.61 ± 0.28 percent for Soviet chinchilla rabbit against live body weight of 2136.67 ± 25.48 g (Table 42). Apparently, therefore there was no marked difference between the two breeds.

The result was found in agreement with Dilella and Zicaralli (1969), Granat and Zelnik (1973), Harbold and Lahole (1973) and Kawinska et al (1975) reported that the dressing percentage in Newzealand white was in between 52.6 to 55.7 percent. Ti-Tarev (1964) found 54.2 percent in Grey giant and 54.5 percent in Soviet chinchilla rabbit. The present findings were also supported by Ozimba and Lukefahr (1990), who observed 53.9 ± 2.4 percent in Newzealand white rabbit against pre-slaughter weight of 1967.00 ± 2.69 and overall mean of 55.1 ± 1.5 percent at pre-slaughter weight of 2008.00 ± 1.79 with different breeds. In this study the dressing percentage was significantly increased...
with the live body weight increase which was in agreement with Parigi et al (1992), who also reported that the dressing percentage increased as the live body weight increased and the age significantly affected the weight. This opinion was supported by Chiericato (1992), Salroo et al (1989), Mahajan and Shastry (1980) and Shastry and Mahajan (1981). However, higher dressing percentage (62 to 65.9 percent) was reportedly obtained by Matassino et al (1966).

The Newzealand white and Soviet chinchilla breeds showed that out of the different cuts of meat, the hindleg cut yielded highest weight of 302.8 ± 6.47 g (15.87 percent) in Newzealand white and 352.17 ± 6.47 g (16.47 percent) in Soviet chinchilla rabbit. The lowest yield was in foreleg cut being 159.67 ± 4.45 g (8.37 percent) in Newzealand white and 180.17 ± 4.45 g (8.43 percent) in Soviet chinchilla rabbit. The result was in agreement with that of Shastry and Mahajan (1981) and Lukefahr et al (1982). The mean weight of different edible offal parts of Newzealand white rabbit was 33.00 ± 2.34 g (3.24 percent) of liver, 16.33 ± 0.84 g (0.87 percent) of kidney and 7.63 ± 0.45 (0.4 percent) of heart. Whereas in Soviet chinchilla rabbit different edible offal parts weight was 65.83 ± 2.34 g (3.08 percent), 14.67 ± 0.84 g (0.69 percent) and 8.83 ± 0.45 g (0.41 percent) for liver, kidney and heart respectively (Table 42).

The different cuts (loin, chest, foreleg and hindleg) showed significantly different yield but near similarity in yield in both the breeds confirming that proportionate growth characters could be achieved by both the breeds. The different cuts yield of rabbit meat in the present investigation was found to be inagreement with Shafie et al (1961) and Auxilia (1970), who could obtain a high percentage of hind quarter meat yield. Darwish et al (1976) and Gilka (1974) were also in support of the present findings. Granat and Zelnik (1973) reported a proportionate higher weight in hindleg in comparison to different cuts of meat as in the present work.

The protein content on dry matter basis of meat of Newzealand white and Soviet chinchilla rabbit on different protein level diets (14, 16, 18, 20 and 22 percent) have been estimated and found to be highest (67.30 ± 0.17 percent and 72.22 ± 3.28 percent
respectively) in D5 (22 percent) diets both in Newzealand white and Soviet
chinchilla meat where as the lowest protein content on

| Protein content | Dry matter basis was found to be 61.24 ± 1.04 percent and 68.40 ± 2.26 percent in Newzealand white and Soviet chinchilla rabbit meat at D1 (14 percent) diet rearing. In Newzealand white rabbit it was clearly indicated that feed having 16 to 22 percent protein in the diet gave better return in terms of better protein meat quality. But in Soviet chinchilla rabbit the diet containing 18 to 22 percent protein yielded the best protein content meat of rabbits than on other diets (Table 44). It was found that Soviet chinchilla rabbit meat contained significantly more protein than the Newzealand white rabbit meat confirming thereby that Soviet chinchilla rabbits are the best meat producer under Barapani environmental conditions. But the result was not in agreement with Ouhayoun et al (1979) who reported that there was no significant effect on level of protein content on carcass quality of Californian rabbits and their crosses.

Raimondi et al (1974) reported working in cross rabbits fed with diet containing 17 to 20 percent protein diets that there was little or no difference on composition of rabbit meat. The results were not in agreement with the findings of Ledin (1982) in carcass composition of Sweedish Landrace rabbit fed with 14.5 to 18 percent crude protein. De halle (1981) and Butcher et al (1983) also could not detect any difference in protein contents between the feed treatments in Californian rabbits when fed with 18 to 20 percent protein diets.

However, the present results were in agreement with Fekete (1992) who found differences in between the treatment groups. The present results were also partially in agreement with Abu-Ashour and Ahmed (1986) who reported that there was an increase in carcass protein from 57.8 to 60.2 percent when associated with crude protein feed from 18.23 to 21.15 percent in the diet.

The dry matter content of rabbit meat was also estimated breed wise and diet wise (14, 16, 18, 20 and 22 percent). In Newzealand white the maximum dry matter percentage was 30.40 ± 0.18 percent in their meat when fed with D2 (16 percent protein) diets. This showed that D2 diet produced the highest output of dry matter in Newzealand white rabbit (Table 44) meat.
In Soviet chinchilla rabbit meat the dry matter percentage was maximum being
25.27 ± 0.35 percent when fed with D4 (20 percent) diet and it was minimum being
22.80 ± 0.10 percent when fed with D1 (14 percent protein) diet (Table 44).

Therefore, for rabbit meat quality, the D4 diets appeared to be best fed for
quality meat production under Barapani ecoclimatic conditions.

The Newzealand white rabbit showed that the average fur yield in weight was
213.17 ± 6.57 g against the live weight of 1908.33 ± 30.56 g, indicating there by that
about 11.3 g of fur was produced per 100 g live weight per rabbit. In Soviet
chinchilla rabbit the average fur obtained was 203.00 ±

Fur weight

3.73 g against the live weight of 2136.67 ± 25.05 g,

which indicated that about 9.50 g of fur was produced
per 100 g of live weight per rabbit (Table 45). The results
showed that the fur weight of Soviet chinchilla rabbit was comparatively lower than that
of Newzealand white rabbit. This variation was probably due to breed difference as the
rearing conditions and climate remained the same.

The breed difference in fur yield was in agreement with that of Zelnik et al
(1972), who reported that in 70 days old californian white, Newzealand white, Danish
white and French silver, the pelt yield was 217, 194, 166 and 200 g respectively, which
was due to breed variation in pelt production. But Shastry and Mahajan (1981) reported
higher fur yield in Soviet chinchilla rabbit (235.00 g) in comparison to Newzealand
white rabbit (205.3 g) against similar live weight in both the breeds. This confirmed that
the fur yield varied from breed to breed.

The production of fur in Newzealand white rabbit was found to be in agreement
with Reddy et al (1977), who recorded 11 g pelt production per 100 g of live weight.

The result obtained by Rao et al (1978) of 11.7 percent fur yield was also in
support of the present work. Ozimba and lukefahr (1990) reported that 11.3 percent of
fur yield could be obtained in Newzealand white rabbit was also in close agreement with
this present study.

The average percentage of fur yield obtained in the present work was found
supported by the yield values reported by Dilella and Zicarelli (1969) in Newzealand
white rabbit. The fur yield in Soviet chinchilla rabbit was also supported by Eschiett et
al (1980), who reported that the fur yield per 100 g of live weight was ranged between 8.8 to 10.43 g.

However, higher percentage of fur yield was reported by Zelnik and Granat (1970), who obtained 18.78 and 17.77 percent of fur yield in Czech Albino and Californian rabbit respectively in comparison to the yield of the present work.

Similarly higher yield of fur 299 g against 2133 g of live weight in crossbreed rabbit was reported by Okerman (1967) and Darmish et al (1970).

Increase in pelt yield with increase of age was also reported by Mahajan et al (1980) but Lahiri and Mahajan (1982) working on Newzealand white rabbit reported that the weight of the animal has a greater bearing in fur yield than the age of the animal. However, this finding was not in agreement with the present study.

It has been well established from the present work that the rabbit farming for meat production under Barapani rearing condition is quite encouraging. But to ascertain the economic viability it becomes essential to adopt eco-feasible rearing technique as detailed. Having ascertained the technical feasibility of rabbit farming under ecological condition of Barapani the economics of rabbit production was calculated taking the expenditure incurred on cage/hutch, feed, labour, medicine etc. It was found that with a dressing percentage of 62% (including head) it will yield a total of 1.00 and 1.03 kg. of dressed meat per animal of Newzealand white and Soviet chinchilla rabbit provided their live weight becomes 1.62 and 1.66 kg. respectively at 90 days. With a selling price of Rs. 60/- per kg. of dressed meat an amount of Rs. 60.00 and 61.80 per fryer rabbit would be realised gaining a profit of Rs. 19.60 and Rs. 21.48 from Newzealand white and Soviet chinchilla rabbit respectively (Table 46). In addition to this profit, the value of furskin @ Rs. 15.00 per furskin would also be realised which would together give a net return of Rs. 34.60 and Rs. 36.48 per Newzealand white and Soviet chinchilla fryer. If a rearer could market atleast 50 rabbit per month his total income would be calculate at Rs. 1734.00 from Newzealand white and Rs. 1844.00 from Soviet chinchilla rabbit.

This clearly indicates that rabbit rearing for meat is profitable particularly for unemployed youth and can also be undertaken as subsidiary family income above that of agricultural practice. The worker in tropical developing countries also reported that
rabbit meat production represents an economical method of securing animal protein (Owen, 1980; F.A.O., 1982). Lebas (1983) claimed that if the need for meat consumption is to be met then the supply has to come from short life cycle animal especially from rabbit farming by small scale rearers.

From the above, it could be concluded that the rabbit rearing under North Eastern Indian climatic condition could be made a sustainable development venture for improving the socio economic condition of tribals and backward classes, who are in majority in this region. This will also increase the production of animal protein to consumer at reasonable cost. It is also quite indicative enough that the backyard rabbitry can be undertaken for family meat supply in this North East India, particularly among the poor class. Therefore, here is the vista for future work in the rabbitry development in the North East India.