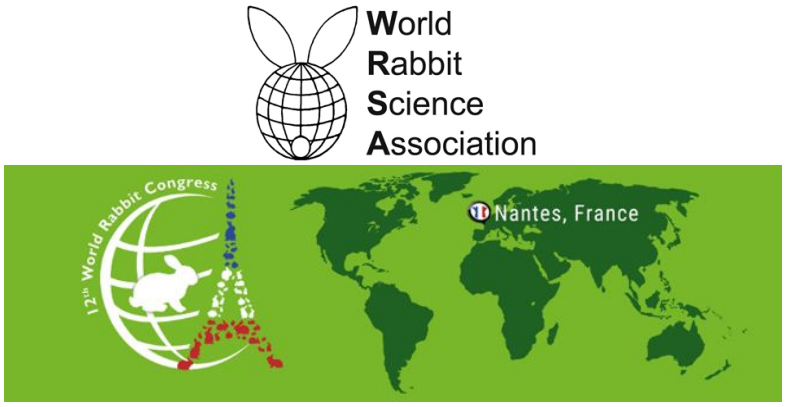

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Full text of the communication

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THE EFFECTS OF STOCKING RATE ON GROWTH PERFORMANCE AND WELFARE OF THE FATTENING RABBITS WHEN PRODUCED UNDER HUMID TROPICAL CONDITION IN TRINIDAD

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ABSTRACT

One hundred crossbred growing rabbits (New Zealand White x California White) ages 28-32 days, mean weight of 700 ± 100 grams were used. Rabbits were housed in wire cages (76 x 50 x 40cm) for 56 days and were randomly allocated to one of five stocking rates originally; 7.9, 10.5, 13.16, 15.79 and 18.42 rabbits /m^2. Environmental measurements were collected. Temperature- humidity index (THI) was calculated using the equation modified by Maria *et al*. (2001). Feed intake and feed conversion ratio was calculated. Five animals per treatment were randomly selected and the rectal temperature, respiration rate, and ear skin temperature were taken daily for the duration of the study. Deaths were recorded and post mortems were performed. Parameters were statistically analysed using One way Analysis of Variance procedure (Minitab 19 for Windows). The environmental conditions were adverse and exceeded the recommended range (THI >28) between 7:30 AM and 7:30 PM. Under these conditions cage density significantly affected total weight gain (P=0.012) and average daily gain (P=0.012) but had no significant effect (P>0.05) on feed intake, FCR, respiratory rate, rectal temperature and skin temperature. Despite no significant differences, all welfare parameters exceeded normal reference ranges at all treatment levels. As stocking rates increased, mortality rate also increased with higher incidence of deaths occurring subsequent to feeding time between 3-7 weeks of experiment. Findings suggest that despite varying stocking rates animals at all treatments were experiencing environmental stress and were using all mechanism possible for thermoregulation. These were consistent with necropsy reports which indicated that all dead animals had a rupture of either sides of the ventricular wall of the heart, blood–tinged serosanguinous in the lumen of the trachea and their stomach was engorged with pelleted rabbit feed which is all consistent signs of heat stress. It is concluded that farmers should not exceed a stocking rate of 13 rabbits/ m^2 when producing rabbits under the adverse tropical environmental conditions of the Caribbean, and it is strongly recommended that farmers pay special attention to feeding times thus avoiding feeding at high THI periods.

Key words: Cage density, Heat stress, Respiratory rate, Mortality, Caribbean

INTRODUCTION

The production of rabbits has been promoted in the Caribbean Community (CARICOM) as an initiative towards mitigating the dependency on meat importation and enhances protein security. This resulted in a drastic increase in production to the point where farmers have exploited high stocking rates towards maximizing their profitability (Lallo *et al.* 2015) However; this decision was made without studying the adverse environmental conditions of the Caribbean and any adverse effects it may have on the rabbit that is known to suffer from heat stress (El Kholy, 2011).

To date, there are no scientific reports which identify an appropriate stocking rate for optimizing productivity and maintaining adequate animal welfare standards for rabbits in the Caribbean. As a result, farmers depend on international reports which suggest stocking rates of 18 rabbits/m^2 (Villalobos *et al.* 2008 and Szendro and Zotte, 2011) and if produced under savannah conditions, rates

should not exceed 14.3 rabbits/m^2 since these have negatively impacted growth performance and the welfare of the rabbit (Yakubu and Adua, 2010).

This study therefore identifies the adverse tropical environmental conditions of Trinidad as a representation of the Caribbean, evaluate the effects of varying stocking rates on productivity and welfare of the growing rabbit and propose a stocking rate for the growing rabbit under these conditions.

MATERIALS AND METHODS

Location

This study was conducted at the University of the West Indies, Trinidad (10°38'15"N, 61°25'39"W).

Animal and Management

One hundred New Zealand White x California White crossbreed rabbits, ages 28-32 days , mean weight 700 ± 100 grams were used. Rabbits were housed in wire cages (76 x 50 x 40cm) for 56 days and were randomly allocated to one of five stocking rates initially; 7.9, 10.5, 13.16, 15.79 and 18.42 rabbits /m^2 corresponding to 3, 4, 5, 6, and 7 rabbits per cage. All treatments were offered a standard commercial feed *ad libitum* (94.2% DM, 16.6% CP, 3.3% EE, 6.9% ADF 4.1% Ash). Feed was supplied to animals at 8am daily. Water was supplied through nipple drinkers at a ratio of 2 animals per nipple. Feed was supplied through a standard hopper at an average feeder space of 15.24cm per head. At the end of the trail the final age of the rabbits were 84-88days old.

Data collection

Environmental measurements (humidity and ambient temperature) were collected using a Davis Vintage Pro2™ weather linkip system. Temperature-humidity index (THI) was calculated using the equation modified by Maria *et al*. (2001). Feed intake was calculated daily based on feed offered and that refused. Weight was measured weekly for the duration of the trial using a Mettler Toledo ® digital scale. Feed conversion ratio was calculated (feed intake / weight gain). Five animals per treatment were randomly selected identified and the rectal temperature, respiration rate, and ear skin temperature were taken daily for the duration of the study. The respiration rate was recorded by counting the flank movements for 15 seconds and multiplied by 4 to give breaths / min. The ear skin temperature was taken using a Laser Thermometer (Infrared Cameras, INC). The rectal temperature was measured using a digital thermometer Digi- sense® model No. 8525-00 supplied by Cole- Parmer Institute Co®. USA. Deaths were recorded daily and tabulated. Dead animals were taken to the School of Veterinary Medicine where post mortems were performed. Dead animals were replaced to maintain effect of stocking rate.

Statistical design

There were 5 treatments with 4 replicates in a completely randomized design. Growth performance and Welfare parameters were statistically analysed using One way Analysis of Variance, Minitab 19 for Windows

RESULTS AND DISCUSSION

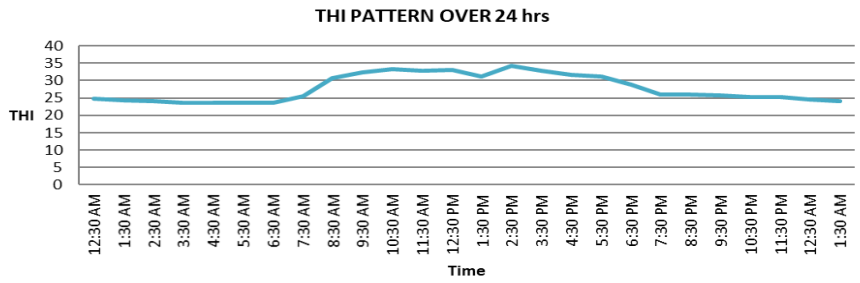

Figure 1: Average THI patttern over a 24hr period for the duration (56 days) of the experiment.

The findings presented in Figure 1 indicate that under the natural environmental conditions of Trinidad, Temperature Humidity Indices (THI) were high (THI 30 -34)between 7:30 AM and 7:30 PM. and exceeded that comfort zone suggested by Maria *et al.*, (2001) for producing rabbits (21-28)

Table 1: Effects of Stocking Rates on growth performance and welfare parameters.

Parameters	Stocking Rate					MSE	
	T1 7.9 rabbits /m^2	T2 10.5 rabbits /m^2	T3 13.2 rabbits /m^2	T4 15.8 rabbits /m^2	T5 18.4 rabbits /m^2	Prob.	
Final live weight (g)	2340.5	2405.7	2443.1	2425.0	2380.3	0.82	27.73
Total weight gain (g)	1682.3^b	1689.6^b	1735.0^b	1615.0^a	1538.9^a	<0.01	19.83
Average daily gain (g)	30.0^b	30.2^b	31.0^b	28.8^s	27.5^s	<0.01	0.35
Daily Dry Matter Intake (g)	93.70	91.52	93.55	87.98	85.88	0.43	3.47
Feed Conversion Ratio	3.5	3.5	3.6	3.5	3.6	0.97	0.15
Respiratory rate Br/min	154	150	156	157	154	0.69	3.57
Body temperature (^{0}C)	31.8	31.6	31.7	31.1	32	0.65	0.42
Rectal Temp ^{0}C	38.5	38.5	38.6	38.6	38.6	0.11	0.18
Water intake (ml/head/day)	380	435	467	470	503	0.95	51.35

^{ab} Means with different letters on the same raw differ significantly (p< 0.05).

The results of the effect of stocking rate on productivity and welfare showed significant differences (P=0.012) for total weight gain and average daily gain (ADG). Both parameters increased between T1 and T3 but decline thereafter indicating that beyond 13 rabbits /m^2 productivity decreased. This was in agreement with findings by Kalaba (2012) which stated that producing rabbits at high densities extended the fattening period resulting in animals taking longer time to reach a marketable weight. Despite no significant differences (P>0.05) between treatments, the following parameters exceeded the reference range for rabbits; respiratory rate (60-60 br/min) (El Kholy, 2011), body temperature (38.1-38.6) (El Kholy, 2011), FCR (3.0 -3.2) (Maertens 2009, water and intake (200-320 ml/d) (Lebas *et al.* 1997).

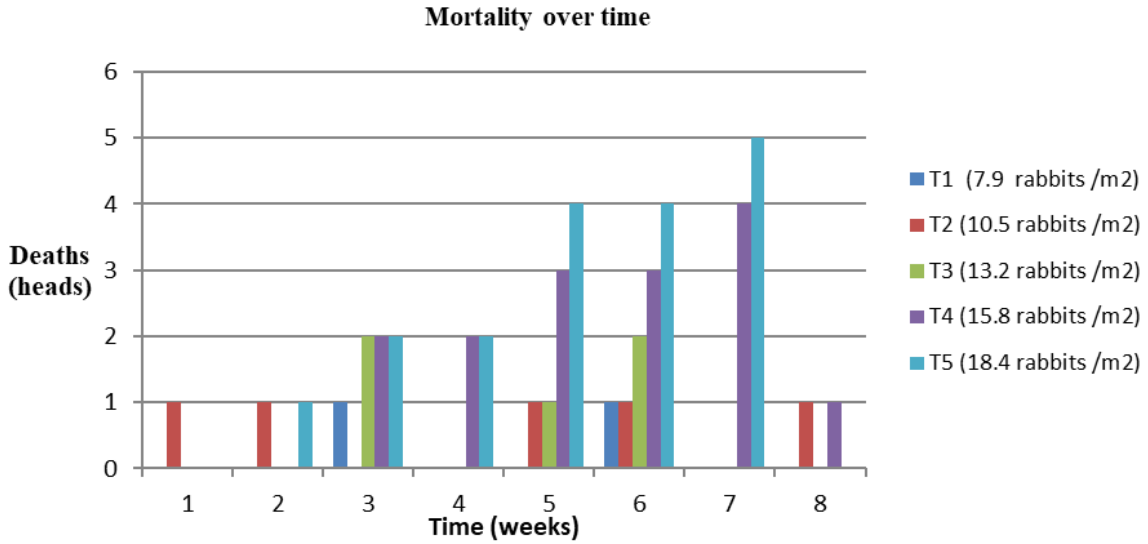

Figure 2: Effects of stocking rate on mortality over time**.**

As stocking rates increased, mortality rate also increased, with higher incidence occurring 3-7 weeks after weaning. These findings suggest that despite varying stocking rates, animals at all treatments were experiencing environmental stress and were using all mechanism possible for thermoregulation. However, as animals grew there was less space in the cage resulting in overcrowding thus increasing their susceptibility to heat stress. These became detrimental subsequent to feeding because as food was digested metabolized energy was added to the adverse environmental conditions. This was most prevalent at stocking rates exceeding 13 rabbits/m^2 and was consistent with necropsy reports which

indicated that all dead animals had a rupture of the ventricular wall of the heart, blood–tinged serosanguinous in the lumen of the trachea and an engorged stomach with pelleted rabbit feed which are all consistent signs of heat stress and were similar to findings reported by Trocino *et al.* (2003).

CONCLUSION

It was concluded from this study that farmers should not exceed a stocking rate of 13 rabbits/ m^2 when producing rabbits under the adverse tropical conditions of Trinidad and the Caribbean. It is recommended that farmers regard feeding times thus avoiding feeding at high THI periods.

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Paul A.[1*], Johnson J.[2] and Lallo C.[3]

Problem Statement

What is the appropriate SR for optimizing productivity while maintaining welfare standards for producing rabbits in the Caribbean ?

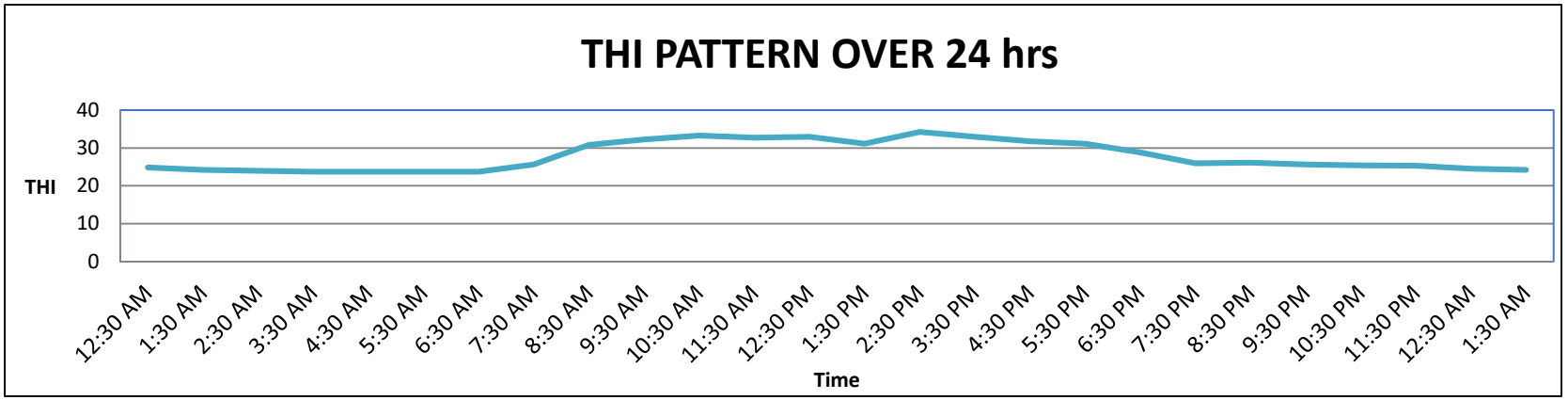
Methodology

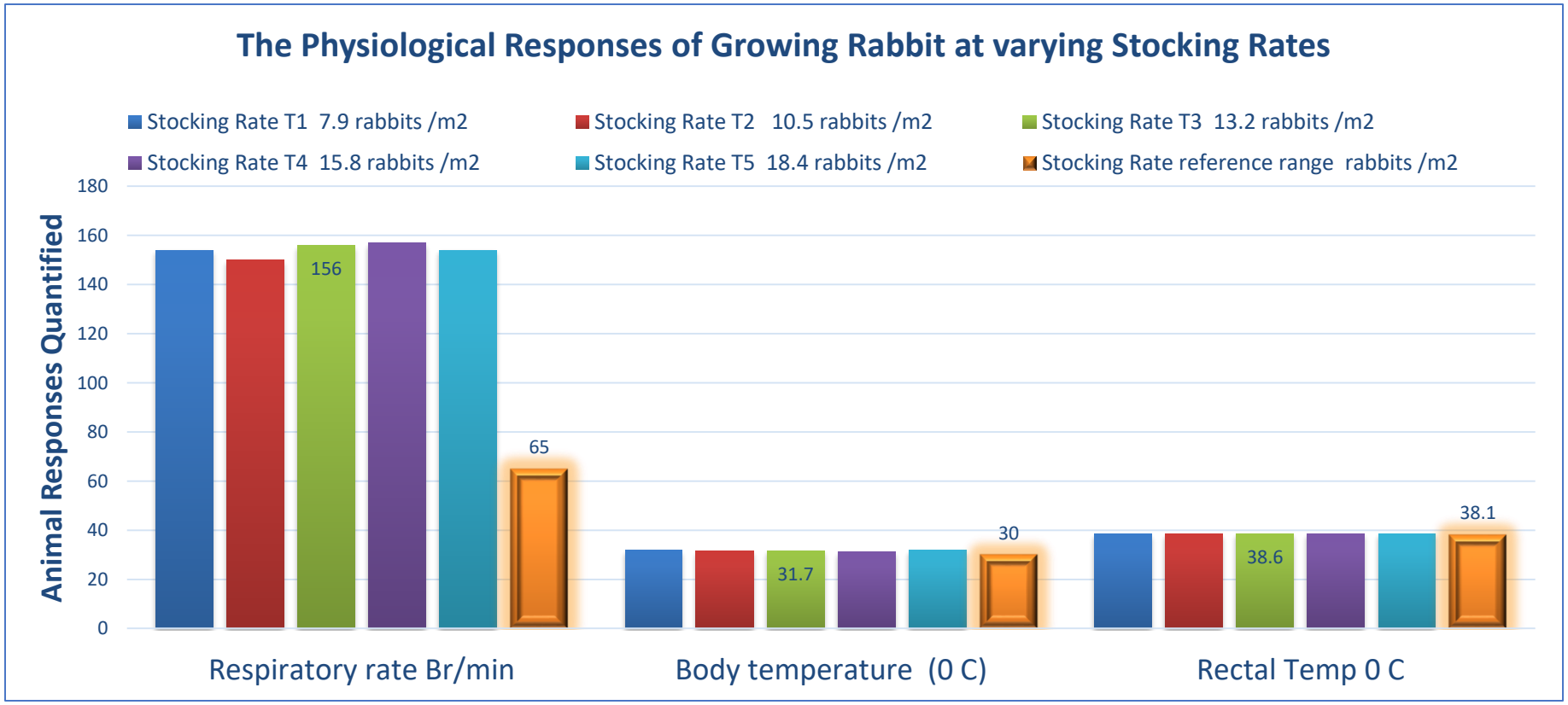
- Animals Housing and Management- 100 NZW x CALI 28-32 days old, intensively cage reared.

- Stocking Rates Evaluated 7.9,10.5,13.16,15.79,18.42 Rabbits /m2

- Statistical Design - 5 treatments, 4 replicates in a completely randomized design.

Results & Discussion

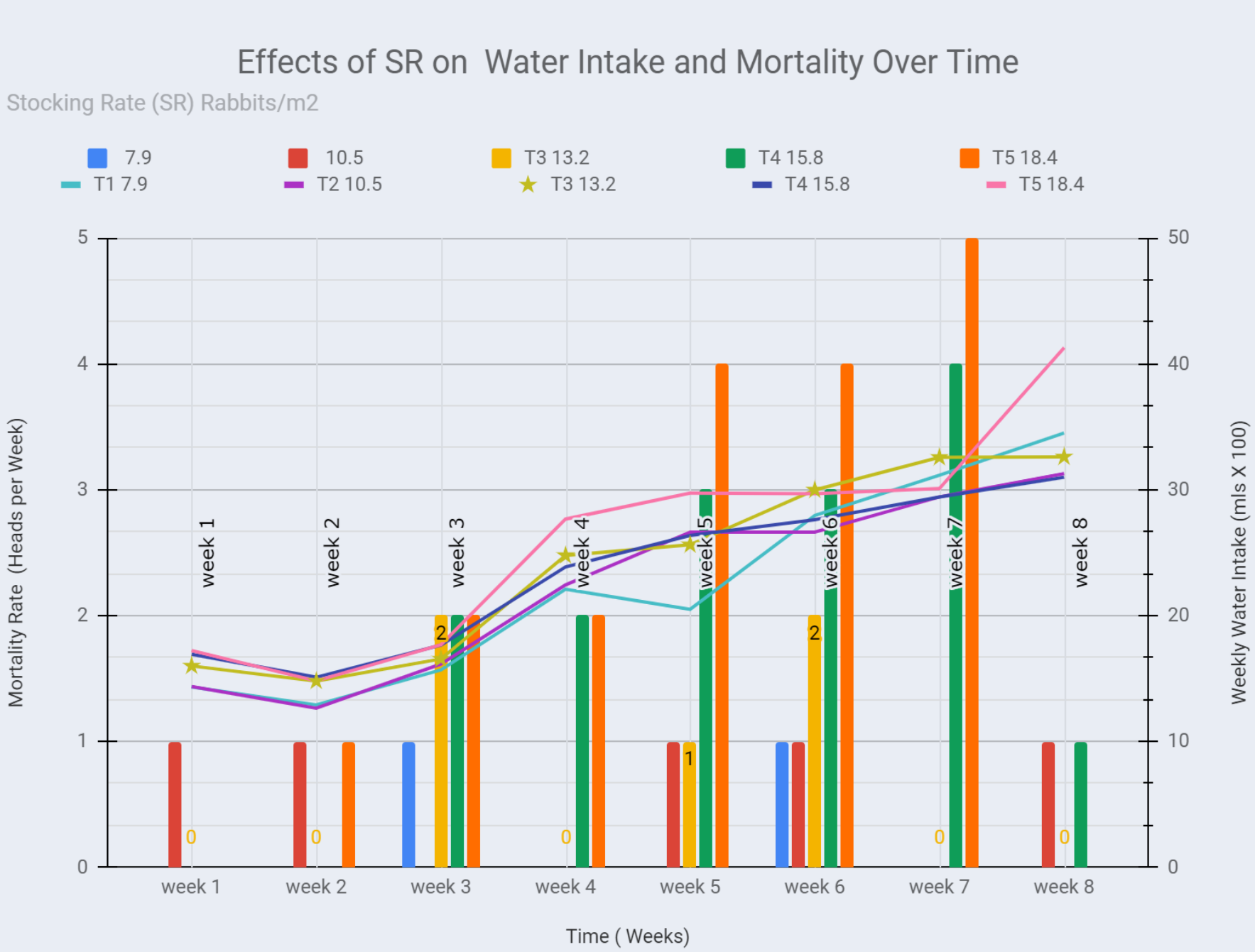




Result & Discussion

Animal Response (Production)

Parametrs	Stocking Rate						MSE	
	T1 7.9	T2 10.5	T3 13.2	T4 15.8	T5 18.4	Reference Range	Prob.	
	rabbits /m^2	rabbits /m^2	rabbits /m^2	rabbits /m^2	rabbits /m^2			
Total weight gain (g)	1682.3^{b}	1689.6^{b}	1735.0^{b}	1615.0^{a}	1538.9^{a}	NA	<0.01	19.83
Average daily gain (g)	30.0^{b}	30.2^{b}	31.0^{b}	28.8^{s}	27.5^{s}	30-32	<0.01	0.35
Daily Dry Matter Intake (g)	93.7	91.52	93.55	87.98	85.88	95-100	0.43	3.47
Feed Conversion Ratio	3.5	3.5	3.6	3.5	3.6	3.0-3.2	0.97	0.15


Effects of SR on Water Intake and Mortality Over Time
Stocking Rate (SR) Rabbits/m2
7.9
10.5
T3 13.2
T4 15.8
T5 18.4
T1 7.9
T2 10.5
T3 13.2
T4 15.8
T5 18.4
Mortality Rate (Heads per Week)
Weekly Water Intake (mls X 100)
Time (Weeks)
week 1
week 2
week 3
week 4
week 5
week 6
week 7
week 8
0
1
2
3
4
5
10
20
30
40
50

Conclusion & Recommendations

Farmers should NOT exceed a Stocking Rate of **13.2 Rabbits/ m2**

when fattening rabbits under the Humid Tropical conditions of the Caribbean region

End of Presentation