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Effect of Feeding Button Weed Silage on the Growth Performance of (*Tenyivo×Hampshire*) Upgraded *Tenyivo* Pig

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Abstract
The present study entitled "Effect of feeding Button weed silage on the growth performance of upgraded Tenyivo pig" was carried out to study the effect of feeding button weed (Borreriaarticularis) silage on twenty upgraded Tenyivo pigs. The experimental animals were divided into two groups of ten animals each. The experimental diet consisted of T1– 100% conventional feeds and T2– 80% conventional feeds + 20% button weed silage. The animals were reared under standard management housing system. The recorded average body weight at ten weeks for T1 and T2 was 10.97±0.75kg and 10.46±0.71kg, respectively with no significant difference (P≥0.05). Average daily gain (ADG) for T1 and T2 was 171.53g and 149.99g respectively. Statistical analysis (t-test) showed no significant difference (P≥0.05) in second, third, fourth, sixth, seventh, eighth and tenth week however, significant difference (P≤0.05) was observed in first, fifth and ninth week. Feed consumption was significantly higher in T1 as compared to T2. The average feed conversion efficiency (FCE) recorded in T1 and T2 was 2.39kgand2.54kg respectively, with no significant difference (P≥0.05). Benefit cost ratio in group replaced by 20% button weed silage was 1:1.28 with net returns of 1146.35 and 1017.28 in the respective treatment groups.

Keywords*: Tenyivo×Hampshire pig, Button weeds (Borreriaarticularis) silage, Conventional feed, feed conversion efficiency, Average Daily Gain.*

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I. Introduction

Pigs are known as valuable converters of inedible feeds into nutritious meat and are commonly reared in pen by village farmers as an alternative source of livelihood income. Pork consumption in the world holds a record of 110 million metric tonnes (mmt) and China had about half of the world pork production, followed by USA and Germany as the second and third largest in pork production holding a record of 50 mmt, 10 mmt and 5 mmt, respectively (McGlone, 2013). According to All India 20th livestock census (2019), pigs constituted about 1.7 per cent of the country's livestock with a record of total pig population of 9.06 million where total exotic/crossbred pigs accounted to 1.90 million and total indigenous/non-descript breed accounted of 7.16 million.

Pig production in India constitutes about one per cent of world pig population and the piggery sector is largely owned by small farmers and landless laborers. Majority of pigs in India are reared in traditional small-scale and subsistence production systems utilizing low-input feeding systems that provides value-added output for farmers by converting feed unfit for human that would otherwise be lost. Smallholder pig farming systems improve livelihood and food security for the people living in rural areas with fewer facilities. In addition from providing protein for human consumption, pigs are often one of the main sources of cash income in rural areas and provide manure for crop cultivation.

Pig rearing is considered as an integral part of the farming system of almost all the tribal populations of the North Eastern region of India. About seventy percent of the pig population is reared under traditional small holder, low-input demand driven production system. Over one quarter of the pigs in India (3.8 million) are found in the North-East region, which bears testimony of importance of pig rearing in the Livelihood systems of farmers (Zaman *et al.,* 2015). The North Eastern accounted for the highest consumption of pork with Assam

having the highest pig herd of 2.10 million (20th Livestock Census, 2019). Pig keeping had been an important part of culture in tribal communities of Assam and Nagaland where pigs were reared in backyard. Due to increased demand for pork and rise in price, pig rearing played a significant role in income generation of the people. Smallholder pig rearing communities of tribal India are benefited through pig farming as it provides nutritional and financial benefits as well as conversion of household wastes into manure for agricultural crops (Chauhan *et al*., 2016). Total of seven breeds of pigs had been registered by ICAR- NBAGR, Karnal, India wherein four breeds were registered from the North Eastern region of the country viz. *Niang Megha, Tenyivo, Doom and Zovawk* (Talukdar *et al.,* 2019) from Meghalaya, Nagaland, Assam and Mizoram respectively.

In Nagaland pig rearing is practiced under a low-input production system where non conventional feed resources contribute majority of the feedstuffs offered to the animals. Small land holders in Nagaland are adopting more profitable and less labour intensive backyard pig production to increase cash returns and accumulate capital in banks (Moanaro *et al.*, 2011). The pig population in Nagaland as per the 20th Livestock Census (2019) was6, 11,785 of which 2, 07,090 are crossbreds and 4, 04,695 are indigenous. Nagaland is considered the highest importer and consumer of pork in the country which provide prospects for a promising sector for piggery enterprise.

Availability, accessibility and affordability of quality feed remain major constraints for pig rearing and utilization of conventional feed ingredients are not economical for small scale farmers because of its high cost. Since feed is the single most important factor that determines the productivity and profitability of pig production, identifying and utilization of locally available low cost feed resources can be well targeted interventions to improve pig production and bring a significant livelihood benefits for tribal and other marginalized pig rearing community in the region. Hence, constant efforts are being made to explore new and alternative feed resources which are being evaluated for its optimum inclusion and utilization.

Button weed (Borreriaarticularis) originally native to the temperate and tropical Asia regions is an annual herb found in forest of Nagaland. The plant mainly available in the autumn season contains 16.81% crude protein (Padmakumar *et al*., 2015) where leaves and stem of the plant are used as non-conventional feeds for pigs by the farmers. Button weed silage can be made for long term storage and utilization as low cost feed for pigs. Silage of the end product of fermenting high moisture crop containing 40-80% water and storing the product is called ensiling. The process is carried out under acidic conditions with pH of 4-5 in order to retain the nutrients and palatability for pigs for consumption. Silage feeds can be stored round the year even during lean season which is an advantage for pig farmers utilizing the available rich fodder crops.

II. Materials And Methods

The study entitled "Effect of feeding button weed silage on the growth performance of upgraded *Tenyivo* pig" was carried out to study the effect of feeding button weed silage on body weight, growth rate, feed intake, feed conversion efficiency and economics of rearing pigs. The materials and methods used for the study are given under the following sub-headings:

Experimental diet

Standard conventional feed containing eighteen percent (18%) crude protein was followed as prescribed by Bhat *et al*. (2010). The concentrated ration consisted of feed ingredients viz. wheat bran, grounded maize, groundnut oil cake, fish meal, common salt and mineral mixture. The compounded feeds was freshly prepared manually in the farm go down once a week

Treatment and feeding

The conventional feeds was provided to T1 group at 2000g per day i.e. 1000g in the morning and 1000g in the evening during the initial stages of experiment and steadily increased at the rate of 200g at weekly basis. While Button weed (Borreriaarticularis) silage was given at the rate of 20% (400g) along with 80% (1600g) of concentrated feed i.e. 800g concentrated + 200g silage in the morning and 800g concentrated + 200g silage in the evening for T2 group and was increased by 50g of button weed silage on weekly basis. The quantity of conventional ration and ensilage feeds supplied to the experimental animal groups were distributed as follows:

T1- Ten weaned piglets fed with 100% concentrated feed.

T2- Ten weaned piglets fed with 80% concentrated feed + 20% Button weed (Borreriaarticularis) silage.

The experimental piglets were fed twice daily once during the active period in the morning 07:00-08:00 hours and the second feeding was given in the afternoon 15:00-16:00 hours. Clean drinking water was provided ad libitum throughout the experimental period.

Statistical Analysis

The data collected were statistically analyzed to interpret the results and to derive for a conclusion. The data so obtained were statistically analyzed by using paired T-test as described by Snedecor and Cochran (1994). All statistical analysis were performed using Microsoft excel. The level of statistical analysis was defined at 5 % level of significance.

III. Results And Discussion

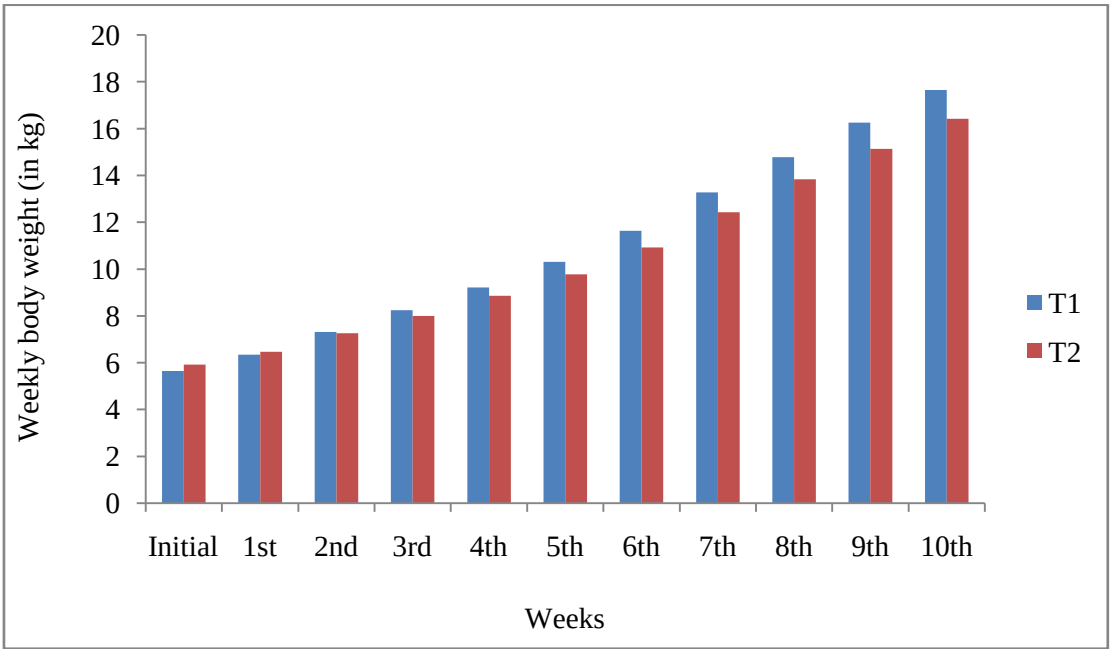
The present study entitled "Effect of feeding button weed silage on the growth performance of upgraded *Tenyivo* pig" was undertaken using twenty experimental animals ranging from 42 to 60 days of age which were divided into two treatment groups. The experimental diet consists of T1 - 100% conventional feeds and T2 - 80% concentrated feed + 20% Button weed (Borreriaarticularis) silage. Data on body weight, average daily gain, feed intake and feed conversion efficiency. Economics of production was calculated to find out the profit and lost. The findings from the study were discussed in this chapter under the following sub-headings:

1.1Body weight

The average initial body weight at the onset of experiment was recorded as 5.64kg and 5.92 kg for the treatment groups T1 and T2, respectively.

Table 1.1 Body weight (kg) of upgraded Tenyivo pig in two treatment groups

Weeks	T_1	T_2
Initial	5.64±0.45	5.92±0.63
1st	6.34±0.48	6.47±0.66
2nd	7.31±0.57	7.26±0.69
3rd	8.25±0.66	8.00±0.69
4th	9.21±0.77	8.86±0.67
5th	10.31±0.80	9.78±0.70
6th	11.63±0.84	10.92±0.74
7th	13.28±0.89	12.43±0.77
8th	14.78±0.94	13.84±0.79
9th	16.25±0.93	15.13±0.78
10th	17.65±0.94	16.42±0.76
Mean	**10.97±0.75**	**10.46±0.71**



The corresponding average body weight at the end of the experiment was 17.65 kg and 16.42 kg for T1 and T2groups, respectively. Statistical analysis indicated no significant difference (P≥0.05) between the treatment groups. The results were in conformity with the findings of Dang *et al.* (2010) who reported the that weight of pigs did not vary among the treatment groups replacing commercial feed with sweet potato silage.

1.2 Average daily gain (ADG) in body weight

The Average daily gain (ADG) in body weight for groups T1 and T2 recorded was171.53 g and 149.99 g, respectively. Statistical analysis showed no significant difference (P≥0.05) between the treatment groups which was in conformity with Dang *et al.* (2010) and Seshoka *et al.* (2020) who had reported no significant difference for growth performance in silage fed treatment groups. The findings were in line with the reports made by Moanaro *et al.* (2011) who had recorded similar daily weight gain when non conventional feeds were offered to local pigs. However significant difference was observed in first week, fifth week and ninth week with recorded values of 99.69±6.52 g, 156.90±8.08 g and 210.70±8.41 g respectively. T1group showed higher daily gain in body weight and agreed with the findings of Kennedy and Sherne (1980) who had reported low growth rate in pigs when fed with non-conventional feeds as compared to conventional feeds. Similar results were made by Wallen beck *et al.* (2014); Lule *et al.* (2017) and Akerfeldt *et al.* (2018) who had reported that groups fed commercial feeds showed higher weight gain than silage fed groups. The difference may be due to type of breed used and the variation in management system.

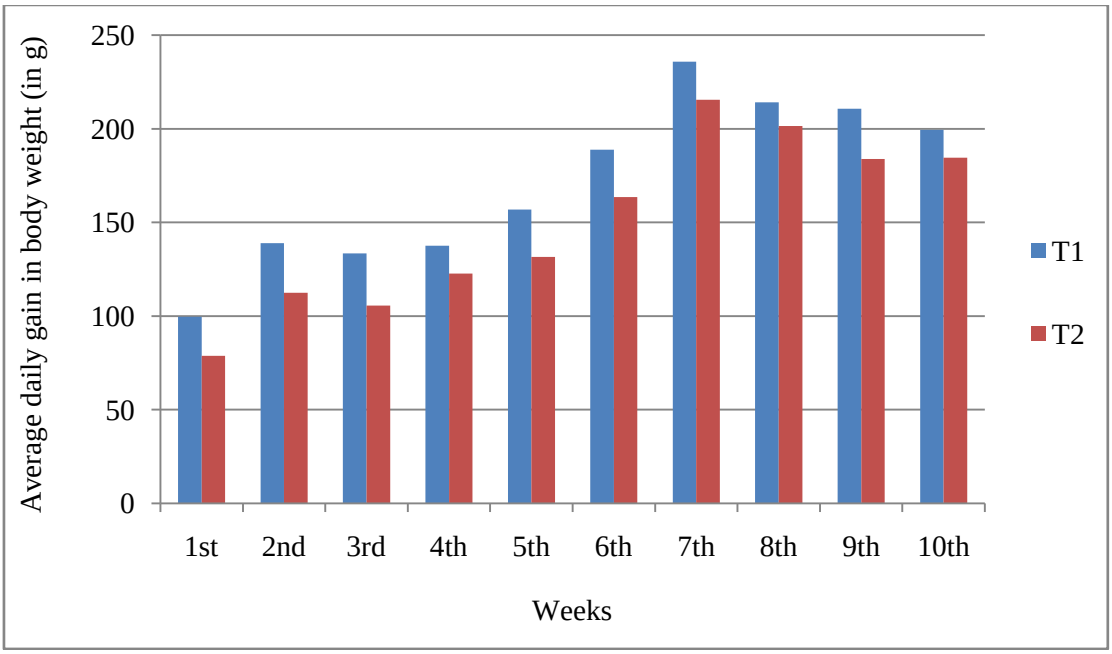


Table No. 1.2: Means + SE of feeding button weed silage on the growth performance of upgraded *Tenyivo* pig.

Traits	Growth performance of upgraded Tenyivo pig (gram)	
	T1	T2
Body weight	10.97±0.75	10.46±0.71
Average Daily Gain	171.53±7.20	149.99±4.08
Feed Intake	2.76±0.01	2.59±0.01
Feed Conversion efficiency	2.39±0.13	2.54±0.09

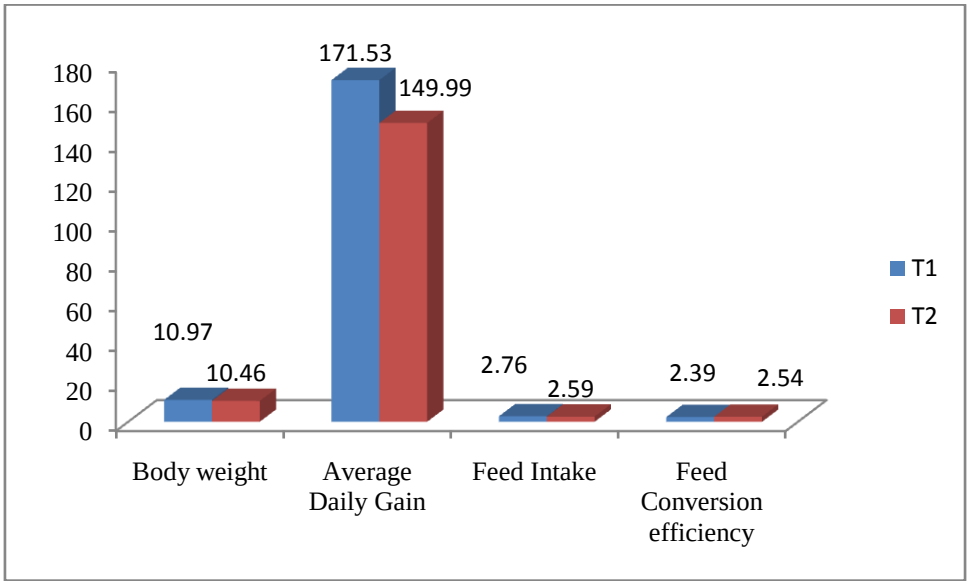
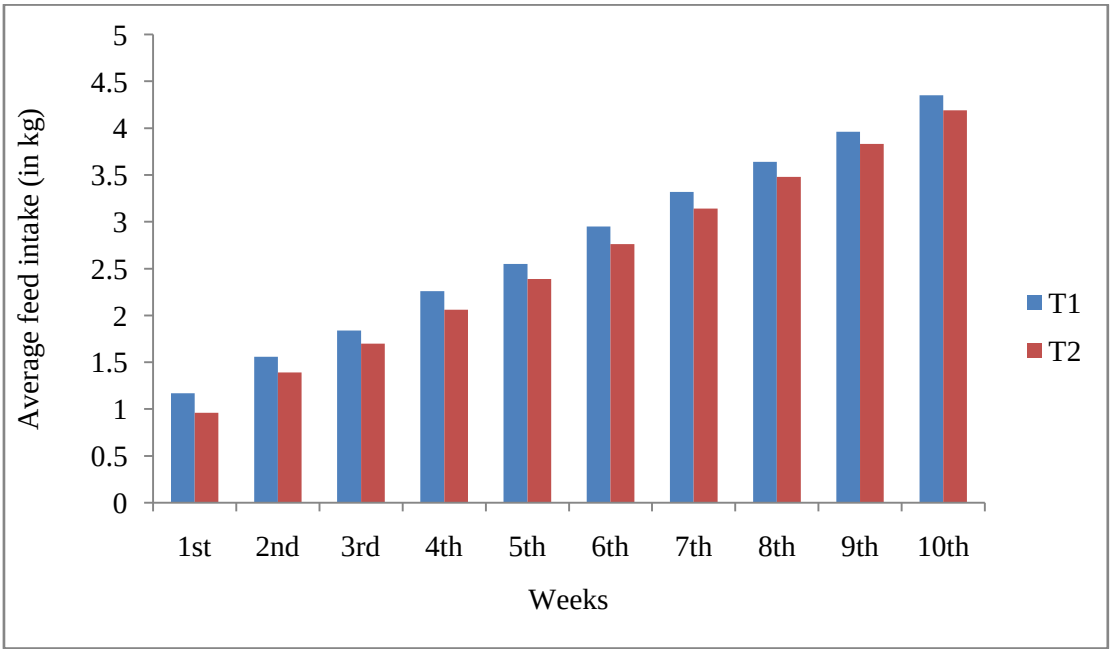


Figure: 1. Show feeding button weed silage on the growth performance of upgraded *Tenyivo* pig.

1.3. Feed Intake

The average feed intake recorded for T1 and T2 groups was 2.76 kg and 2.59 kg, respectively.

Weeks	T_1	T_2
1st	1.17±0.01[a]	0.96±0.02[b]
2nd	1.56±0.03[a]	1.39±0.02[b]
3rd	1.84±0.02[a]	1.70±0.03[b]
4th	2.26±0.03[a]	2.06±0.03[b]
5th	2.55±0.03[a]	2.39±0.03[b]
6th	2.95±0.03[a]	2.76±0.03[b]
7th	3.32±0.02[a]	3.14±0.03[b]
8th	3.64±0.02[a]	3.48±0.03[b]
9th	3.96±0.02[a]	3.83±0.03[b]
10th	4.35±0.03[a]	4.19±0.04[b]
Mean	**2.76±0.01**	**2.59±0.01**



Statistical analysis indicated significant difference (P≥0.05) between the treatment groups. Feed consumption increased in all the treatment groups from the first week to tenth week. Feed intake increase from 1.17±0.01 kg from first week to 4.35±0.03 kg in the tenth week. Similar trend was observed in treatment two

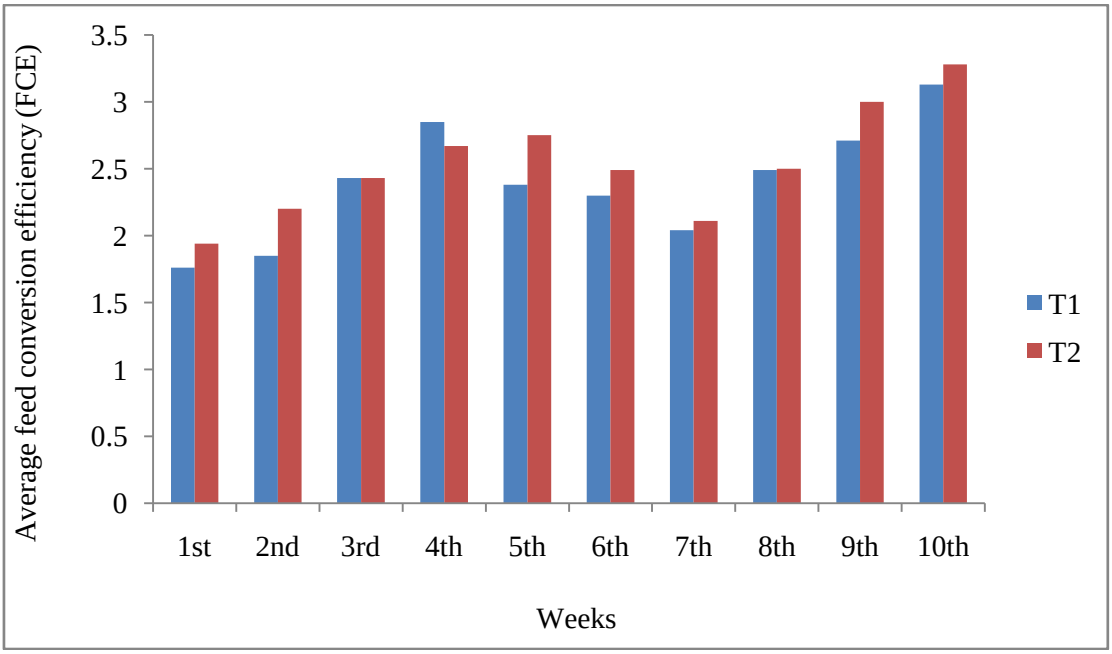
with feed intake starting from 0.96±0.02 kg and 4.19±0.04 kg in 1st week and 10th week respectively. The findings were in line with Loc *et al.* (2000) who reported similar feed intake.

1.4 Feed conversion efficiency (FCE)

The average feed conversion efficiency (FCE) was recorded as 2.39 and 2.54 for the respective treatment groups. Statistical analysis did not show any significant difference (P≥0.05) between the treatment groups.

Table 1.4 Feed conversion efficiency (FCE) of upgraded Tenyivo pigs in two treatment groups

Weeks	T_1	T_2
1st	1.76±0.14	1.94±0.25
2nd	1.85±0.28	2.20±0.39
3rd	2.43±0.44	2.43±0.20
4th	2.85±0.43	2.67±0.30
5th	2.38±0.13	2.75±0.23
6th	2.30±0.12	2.49±0.14
7th	2.04±0.09	2.11±0.08
8th	2.49±0.14	2.50±0.10
9th	2.71±0.09[b]	3.00±0.09[a]
10th	3.13±0.06	3.28±0.12
Mean	**2.39±0.13**	**2.54±0.09**



1.5 Economics of pig rearing

The total cost of production was Rs. 3860.65 and Rs. 3637.52 for T1 and T2 groups, respectively. The total receipts from the sale of pigs, manure, and gunny bags were Rs. 5007.00 and Rs. 4654.80 in the two treatment groups, respectively. The net return was Rs. 1146.35 and Rs. 1017.28 for T1 and T2 groups, respectively. The Benefit Cost Ratio is1:1.30 and 1:1.28 in the respective treatment groups. Result findings were in line with Moanaro *et al.* (2011) who had reported benefit cost ratio of 1:2.52when pigs were offered non conventional feed resource. Cost of feeds was observed to be lower in T2 as compared to T1 group. Similar reported were made by Locet al. (1997); Singh *et al.* (2008); Moanaro *et al.* (2011); Nguyen *et al.* (2011); Kambashi *et al.* (2014) and MarsyAsindu *et al.* (2019)that feeding non-conventional ensiled feeds to pigs can be economically efficient and could facilitate in lowering the feed cost.

1.6 Economics of rearing upgraded *Tenyivo* pigs in two treatment groups

Sl. no.	Particulars	Treatment groups	
		T_1	T_2
1.	Cost of piglets (Rs.)	2500.00	2500.00
2.	Cost of feeds (Rs.)	1115.65	892.52

3.	Miscellaneous cost (Rs.)	15.00	15.00
4.	Cost of labour (Rs.)	230.00	230.00
5.	Total cost of production (Rs.)	3860.65	3637.52
6.	Final body weight (kg)	17.65	16.42
7.	Sale of pig @Rs.280 per kg live weight	4942.00	4597.60
8.	Sale of manure (Rs.)	50.00	50.00
9.	Sale of gunny bags @Rs.5/bag	15.00	7.20
10.	Total receipt (Rs.)	5007.00	4654.80
11.	Total profit (Rs.)	1146.35	1017.28
12.	Profit (Rs./kg live weight)	64.95	61.95
13.	Benefit Cost Ratio	1.30	1.28

IV. Conclusion

Upgraded *Tenyivo* pigs under intensive housing system have the potential towards the development of sustainable pig farming in North East India. The present study recorded suitable daily gain and better feed conversion efficiency under Nagaland environmental condition. Pig serve as a valuable source of protein, vitamin, minerals and an important income source for the rural mass. The results generated from the study could support developing further research and aim to improve swine production and reproduction sector enhancing economic benefits for the farmers in particular and country as a whole.

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Reference

[1]. Presto Åkerfeldt, M., Nihlstrand, J., Neil, M., Lundeheim, N., Andersson, H. K. and Wallenbeck, A. (2019). Chicory and red clover silage in diets to finishing pigs—influence on performance, time budgets and social interactions. Organic Agriculture, 9(1), 127-138.

[2]. Asindu, M., Ojako, J.M., Lule, P.M., Naziri, D. and Ouma, E. 2019. Economic analysis of sweetpotato silage based diets for smallholder pig farmers in Uganda. The6th African Conference of Agricultural Economists.Abuja, Nigerisa. September 23-26, 2019.

[3]. Lyngkhoi, L. C., Rutsa, M. C., Savino, N., Zuyie, R. and Vidyarthi, V. K. (2020). Effect of Different Housing Systems on Some Behavioral Characters and Growth Performance of Upgraded Tenyivo Pigs.

[4]. Rahmann, G. (2014). Building Organic Bridges: Vol. 4, Sweden-Viet Nam; Proceedings of the 4th ISOFAR Scientific Conference at the Organic World Congress 2014, 13–15 October 2014 in Istanbul, Turkey.

[5]. Bocian, M., Jankowiak, H., Kapelański, W. and Lenartowicz, M. (2017). The fattening results of pigs fed with a diet with the participation of silage from steamed potatoes. Journal of Central European Agriculture.

[6]. Borin, K., Lindberg, J. E. and Ogle, R. B. (2005). Effect of variety and preservation method of cassava leaves on diet digestibility by indigenous and improved pigs. Animal Science, 80(3), 319-324.

[7]. Buntha, P., Borin, K., Preston, T. R. and Ogle, B. (2008). Effect of Taro (Colocasia esculenta) leaf silage as replacement for fish meal on feed intake and growth performance of crossbred pigs. Livestock Research for Rural Development, 20.

[8]. Chauhan, A., Patel, B. H. M., Maurya, R., Kumar, S., Shukla, S. and Kumar, S. (2016). Pig production system as a source of livelihood in Indian scenario: An overview. Int J Sci Environ Technol, 5(4), 2089-96.

[9]. Dang, Q.H., Kawahara, S., Tsugeta, M., Niimi, M., Horinouchi, S., Iwakiri, M. and Muguruma, M. 2010. Effects of Soybean Curd Residue Silage on the Growth Performance, Meat Quality, and Cecal Microbial Population in Finishing Pigs. Journal of Warm Regional Society of Animal Science, Japan.53. 145-155. 10.11461/jwaras.53.145.

[10]. Dom, M., & Ayalew, W. (2010). Effect of replacing 50% of a commercial grower feed with sweet potato silage on the performance of crossbred pigs in Papua New Guinea. Journal of South Pacific Agriculture, 28.

[11]. Kambashi, B., Boudry, C., Picron, P. and Bindelle, J. 2014. Forage plants as an alternate feed resource for sustainable pig production in the tropics: A review, Animal. **8**:1298-1311.

[12]. Karunakaran, M., Mohan MandaI, K., Rajarajan, H.D., Karmakar, B.P., Bhatt, Jitumoni Das, Bhaskar Bora, K.K. Baruah and C. Rajkhowa. 2009. Early puberty in local Naga boar of India: Assessment through epididymalspermiogram and in vivo pregnancy. Animal Reproduction Science. **111**: 112-119.

[13]. Kennedy,J. J. and Sherne, F. X. 1980. The effects of fibre addition to diets formulated to contain different levels of energy and protein on growth to carcass quality of swine. Journal of Animal Science. **107**: 294-29.

[14]. Livestock Census, 2019. Directorate of Economics and Statistics, and Animal Husbandry Statisrtics Division, Department of Animal Husbandry, Dairying and Fisheries, Ministery of Agriculture, New Delhi. pp: 33-34.

[15]. Loc, N. T. H. and Giang, V. D. 2000. Effect of different levels of ensiled cassava roots in diets on performance and carcass quality of F1 (MCxLW) Fattening pigs. Science and Technology Journal of Agriculture and Rural Development. **10**: 441-443.

[16]. Loc, N. T., Ogle, R. B. and Preston, T. R. 1997. Cassava root silage for crossbreed pigs under village condition in central Vietnam. Livestock research for rural development. **9** (2).
[17]. Asindu, M., Ojakol, J. F., Lule, P. M., Naziri, D., & Ouma, E. (2019). Economic analysis of sweetpotato silage based diets for smallholder pig farmers in Uganda.
[18]. Einstein, A., B. Podolsky, and N. Rosen, 1935, "Can quantum-mechanical description of physical reality be considered complete, Phys. Rev. 47, 777-780.
[19]. Ly, N. T. H., Le Van An, L. V. P., & Phuong, D. T. (2001, August). Effect of using ensiled cassava roots and ensiled cassava leaves under village conditions. In Proc. National Seminar/Workshop on Research and Extension of Cassava in Vietnam, held in Hue city, Vietnam (pp. 179-186).
[20]. McGlone, J. 2013. The future of pork production in the world: Towards sustainable, welfare-positive systems. Animals. **3**(2): 401-415.
[21]. Moanaro, Ngullie, E., Walling, I., Krose, M. and Bhatt, B. P. 2011. Traditional Animal Husbandry Practices in Tribal States of Eastern Himalaya, India: A Case Study. Indian Journal of Animal Nutrition. **28** (1): 23–28.
[22]. Muteika, D., Ojakol, F., Lule, P. M., Kyalo, G., Pezo, D., Naziri, D. and Lukuyu, L. 2017. Effect of sweet potato silage diets on performance of growing pigs in Uganda.International. Livestock Research Institute,Uganda. Makerere University, Uganda. International potato center.
[23]. Nguyen, T.H.L., Ngoan, L.D., Verstegen, M.W.A. and Hendricks, W.H. 2011. Inclusion of ensiled cassava km94 leaves in diets for growing pigs in Vietnam reduces growth rate but increases profitability. Journal of Animal Science. **24**(8): 1157-1163.
[24]. Padmakumar, V., Nazrul, H., Sirie, R., Kobu, K., Rameswar, D., Rutsa, V. and Solomon, K. (2015). Availability and nutritional value of wild forages as feed for pigs and mithun in Nagaland, India. Availability and nutritional value of wild forages as feed for pigs and mithun in Nagaland, India.
[25]. Rutsa, M. C. and Rutsa, V. 2016. Tenyivo- an indigenous pig germplasm of Nagaland. Booklet printed at Creative Graphics. pp: 9-10.
[26]. Sarria, P. I. and Martens, S.D. 2013. The voluntary intake in growing pigs of four ensiled forage species. Agricultural and food science.**22**: 201-206.
[27]. Seshoka, M. L., Fourie, P, J., Kanengoni, A, T., Malebana, I. M. M., Thomas, R. S. and Nkosi, B. D. 2020. Dietary inclusion of ensiled avocado oil cake affects growth, nutrient digestion, and carcass characteristics of pigs. South African Journal of Animal Science. **50**(6).
[28]. Singh, M., Lallo, C. H. O. and Ramlal, H. 2008. The effect of feeding molasses-ensiled cassava and sweet potato on growth performance and carcass quality of growing-finnishing pigs. In: Proceedings overcoming challenges to Sustainable Agri-food systems, International Congress on Tropical Agriculture, Hyatt Regency Trinidad. 318-324.
[29]. Snedecor, G. W. and Cohran, W. G. 1994.Statistical Methods.8th Ed. Oxford and IBH Pub.Co. New Delhi, India.
[30]. Talukdar, P., Talukdar, D., Sarma, K. and Saikia, K. 2019. Prospects and potentiality of improving Pig farming in North Eastern Hill region of India: An overview. International Journal of Livestock Research. **9**(01): 1-14.
[31]. Thomas, R., Nkosi, B. D., Umesiobi, D. O., Meeske, R., Kanengoni, A. T. and Langa, T. 2010. Evaluation of potato hash silage from two bacterial inoculants and their effects on the growth performance of grower pigs. South African Journal of Animal Science. **5**(1).
[32]. Wallenbeck, A., Rundgren, M. and Presto, M. 2014. Inclusion of grass/clover silage in diets to growing/finishing pigs–Influence on performance and carcass quality. Acta Agriculturae Scandina vica. Section A- Animal Science. **64**(3):145-153.
[33]. Zaman, G., Shekar, M. C., Laskar, S., Ferdoci, A. M. and Rank, D. N. 2015.Molecular characterization of Assam Local pig. Indian Journal of Biotechnology, **14**: 416-419.

Talilemba, et. al. "Effect of Feeding Button Weed Silage on the Growth Performance of (Tenyivo×Hampshire) Upgraded Tenyivo Pig." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 15(12), 2022, pp. 08-15.