

Common Root Tubers in Domestic Tropical Livestock Feeding a Technical Report on Domestic Tropical Livestock Agriculture

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Abstract

Feeding in livestock is the primary extrinsic (husbandry) factor to consider above most other production factors following the intrinsic or endogenous circumstances such as the vertical resources and genetic potentials of the animal or its specie, breed, variety.

In the tropics, especially the common domestic feeding ingredients and local supplementary resources include the grains, tubers, crop residues and other bulk inputs, especially the industrial by-products and micro-nutrients, which are used as fodders that compose of the entire plants – tubers or vine, grasses or cereal crops and legumes, the leaves and stalks to supplement forages.

For ruminants, pigs and rabbits in particular, there are several root tubers that are used either as main feeding ingredients or dietary supplements in their feeding. In addition, for being the basic bulk inputs for energy and dietary fibre, these tubers serve as feeding resources that alleviate human and industrial competitions for consumption, utilization, other social or economic development and scientific advancements. Prominent amongst these tubers are cassava (strictly edible varieties, which are low in cyanide), yam, sweet potatoes and cocoyam, all of which are commonly available in various localities. In addition, in many rural communities, plantain, banana and other meal fruits are equally relevant where available and feasible. While whole grains and forages form the solid meals for these livestock, the peels and other extracts, including the fermentation broths or vine like the leaves or stalks are equally used in fresh or dried forms. Others are processed through local or domestic industrial handling into residues; or used as direct farm produce.

Potatoes belong to a plant genus of about 500 varieties occurring globally, which are mostly warm-climate dwarf shrubs, which can be freely found twining or trailing just as it other herbaceous plants of the family Convolvulaceae – which is popularly known as the Common Morning Glory or Ipomoea. The specie has funnel-shaped pink to rose-violet flowers, which are often about 5-cm (2-inch) as well as oval or lobed leaves.

Human and Global Economic Importance

Although, the human economic importance of the crawling plant globally can never be overemphasized right from the primitive through the orthodox to modern agricultural practices. Other crops such as tubers or rhizomes include cocoyam, unripe plantain, ginger (especially mango ginger, which emerge in the recent through scientific improvement of indigenous tropical varieties of ginger), paw-paw (the leaves, stem and fruits whether ripe or unripe) and water melon. However, these same resources have become paramount relevance in the feeding and supplementary importance in livestock production.

Apart from its prehistoric discovery of just for the beauty of its flowers, the tuberous roots of the edible enlarged food-storage portions of the roots (tubers) of the genus *Ipomoea batatas* has been very important to humans. It used to be a perennial crop with solid and several (multiple) well-formed roots as it trails along the ground. However, when these tubers are developed off the soil as aerial tubers, such are usually high in fibres with excessive storage of phytoalexin, tannin and highly lignified (low calorogenic) starch.

Technical Biography

Sweet potato amongst other economic resources, is importantly relevant to contain some phytoresources for ethno-veterinary formulations and organic livestock, which although not limited to, but includes –

» Phytochemical resources of sweet potato

This contains certain potent ethno-veterinary properties and phyto-genic resources, especially in its soil and aerial tubers with other alkaloids, especially d-lysergic and d-isolysergic acids for the

commercial synthesis of Lysergic acid diethylamide – LSD. This synthetic drug from the addition of compound diethylamide to the naturally occurring varieties, which has high hallucinogenic potentials usually obtained to form ergot-related alkaloids, such as ergostamine and ergonovine, which can be used to block the action of serotonin (which is the indole amine transmitter of nervous impulses) in the brain tissue for the inhibition of serotonin reuptake inhibition to reduce stress-related complications.

In addition, the vine (leaves, roots and stems or flowers) contain certain prominent kinds of substances that are important in animal husbandry and livestock production, especially in the boosting of growth and performance parameters; enhancement of milk let-down and management of certain stress-related complications, including anorexia nervosa and control of bullying or fighting order in ruminants and pigs. It has been discovered to be an excellent trainer feeding resources in creep and weaning of growing rabbits, pigs and calves.

The naturally occurring substances contained in sweet potatoes have been shown in various trial research and nutritional experiments to contain certain anti-oxidants, physiological polyphenols, high dietary fibres and naturally occurring carotenoids (β – carotene), which are stable to withstand most processing and conversion procedures to be easily converted into Vitamin A. In addition, the short-chain starches and fatty acids (SCFAs) are easily metabolized even by young or tender intestines and convalescent patients, thus making it a good choice in dietary energy supplements. These phytochemical resources are very important in the prevention, management or control of diseases (whether pathogenic or non-infectious in nature) in animals or humans and environment including other plants.

» The fresh leaves and its entire vine

These are good during the dressing of ulcerated wounds, especially because the leaves are high in phytoalexin, which is very strong defensive chemical to protect the crop from field infection by certain pathogenic agents or quick rotting with autolytic (decomposition) upon exposure to some natural factors/ environmental agents of stress.

» The fresh tubers –

Almost all the commonly available varieties of *Ipomea batatas* are very high in precursor carotenoids and anti-oxidants:

» These resources are easily converted by the liver and other tissues involved in erythropoiesis during the formation and maturation of the erythrocyte cell walls, especially in pigs or rabbits. These attributes have been domestically demonstrated by farmers to be of paramount importance for feeding rabbits and for fattening castrated growing pigs and calves; young or growing animals, especially following immunization and convalescence.

» The tubers and leaves of any sweet potato species in combinations with certain commonly growing leguminous or grass forages like the leaves of the devil/ bengal bean or mucuna (*Mucuna puriens*), puero or tropical kudzu (*Pueraria phaseoloides*) and

Rhizoma peanut (*Arachis glabrata*), centrocenma; Calopo (the wild ground nut – *Calopogonium mucunoides*), the sweet clover plant (*Tritolium repens*), the Centro (*Centrocnema pubescens*), velvet bean (*Stizolobium deeringianum*), brown hemp plant (*Lablab purpureus*) and cowpea (*Vigna species*) provide excellent assistant dietary or supplementary resources for reticulo-endothelial tissues in the production and sustenance of immunoglobulins in pregnant cows.

» The high contents of short-chain fatty acids add to its nutritional and dietary potentials the gut-availability and metabolism of oil-soluble vitamins and white blood cells physiology. Although, cocoyam equally provides highly parallel synergies in comparison to sweet potatoes, however, the feasibility of production and short term index makes sweet potatoes to be a preferred choice in tuber utilization as supplement for feeding livestock animals.

» In addition, the orthodox farmers have discovered that feeding a combination of unripe plantain/ plantain peels or bananas with fresh sweet potato tubers to freshly delivered animals (sows and does – rabbits and goats alike) immediately following delivery spurs the production and secretion of milk/ milk-let-down. In cases of non-infectious agalactia, especially when this is not due to mammary fibrosis, mastitis of mammary cystitis, feeding sweet potato twice daily or as supplementary tuber has been of valued response rather than administration of oxytocin in organic cattle and pigs.

» In foster nursing, especially when the litter size is high with low milk production and pre-weaning training of piglets, the value of short-chain polysaccharides and non-lignified starches in sweet potato tubers have beaten the bars to facilitate higher gut integrity, digestibility, energy conversion and weight gain once the animals are trained to start picking up the small cuts or as mixed up in their training creep feeds. In addition, rural farmers and indigenous communities have discovered its potentials (in humans) to aid in the immediate recovery from exhaustion and anorexia nervosa by boiling it for direct consumption.

» Often times in the recent, sweet potatoes have been seriously competing with cassava in the starch, flour and alcohol producing industries.

For the wet or dried crop (vegetation) –

» This is exceptionally useful in raising snails both for cover from ambient and environmental circumstances, especially in combination with other dried forages like plantain,

» The matured crop-plant of sweet potato is of good value in feeding of farm animals or be included as green forage for silage production. Although, silage is not acceptable in organic livestock farming because of certain ensiling resources, however, the creeping parts can be chopped and mixed with other forage resources to feed livestock, especially when mixed with other leguminous crops.

» It is of high values in the mulching of other crops, especially

during dry and scorching weathers

» Dried sweet potato forage is good for the improvement of soil fertility. It contains high plant proteins which are released during decomposition with humus quickly following shallow ploughs once there are few heavy rains or repeated watering for short term or arable cropping and vegetables production.

» When soaked overnight in clean water, the dried vegetation provides and light brown broth that has been added directly into the drinking water of ruminants and pigs to increase water intake in hot periods to avoid tissue dehydration or joint cramps in heavily pregnant animals.

» In the orthodox operations, the young leaves are often cooked as vegetables while the slightly brownish (fresh) leaves are often used on farms to manage fresh wounds or reduce bleeding, making it to serve as astringents.

» Dietary supplements and nutritive resources – Naturally, sweet potato as other indigenous root and tuber crops provides all the essential plant nutrients without any discovered or already reported anti-nutritive factors –

» It is a ready-made source of immediate soluble sugars following digestion into the bloodstream of lactating animals, thereby becoming an important reference in grass-tetany and disjointed convulsion in severely weak animals

» The proteins and natural (precursor) dietary resources in the fresh leaves and tubers of sweet potato makes it one of the best and feasible option in feeding livestock animals once the crop is grown within the farming premises

» The crop has high palatability and pleasant (non-repulsive) odor, which even makes its farm vulnerable to grazing and straying livestock. The milk from the fresh crop is exceptionally high in soluble sugars, thereby making it irresistible for rabbits and other mini-livestock, pigs and small ruminants.

» The tubers are high in mineral and other anti-oxidant resources in addition to high caloric easily digestible contents

» The tubers are easily processed into various staple products, including direct sun drying or industrial conversion with relatively stable shelf life.

» For good gut integrity and intestinal physiology – naturally, it has been demonstrated that sweet potato enhances gut total microbiota, which often cause severe diarrhea and gut dysfunctions in young or growing animals following consumption, even when fed raw. Unlike in many other tubers, especially cassava and some varieties of yam, feeding of fresh sweet potato directly to young or nursing farm animals and livestock has become an enticing experience for farmers, thereby counting it a training resources for pre-weaning or late creep supplementary material.

In addition, the physical appearance and non-laboratory exam-

ination of fecal (wastes) resources from animals fed sweet potato could literarily establish the fact of enhancing gut integrity and intestinal physiology; devoid of interference gut physiology and performance due to likely presence of anti-nutritive substances.

» Poverty alleviation and economic livelihood – Almost all the varieties of sweet potato (whether indigenous or improved varieties) readily grow on any farming soil with little nutrient values, provided the environment is not waterlogged and can have good access to sunlight. Once such soil can retain moisture, especially during its early 2-3 months of life for growth and tuber formation, the crop requires little technicality to handle because it can be cultivated directly from the stalk or regrow from the fragments of tuber residues from the previous cultivation that remains in the soil.

The crop yields exceptional qualities and quantities from soil with close accessibility to farm wastes, thereby assisting to convert farm wastes to other crop resources, which makes it a better option for the improvement of tropical indigenous economic livelihood.

» Environmental management and protection – It is naturally drought-resistant and can survive on any soil with low fertility. In addition, it enhances environmental refresh, especially when planted on open spaces in between pens or around the farm. In most farms where sweet potatoes are properly cropped, there had been recognizable reduction in husbandry complications like frequent visceral gout and heat stress, especially in poultry and rabbit farms.

» Improved productive society and public healthcare delivery through livestock feeding and concentrates supplement – There are several published research findings to establish the fact that sweet potato actually improves productive society and public healthcare delivery. Sweet potatoes have been used in various medicinal resources, confectionery and dietary conversion industries, extraction and production alcohols, starch and flour, and nutritional supplements. Sweet potato encourages optimum production/synthesis, release and utilization of short chain fatty acids, especially butyric acid instead of threatening trans-fats. Trans-fats or trans-fatty acids are a form of unsaturated fats, which can come in both natural and artificial (synthetic or refined) forms:

» The natural forms are often found in the rumen of ruminants as an end product of fermentation and metabolism of certain oil and organic substances. However, trans-fats occur in naturally in the meat and dairy, especially in higher occurrences from ruminant livestock such as such as cattle, sheep, and goats rather than other farm animals including pigs, poultry, rabbits and fishes. Trans-fats can also be released naturally during bacterial fermentation in these animals' stomachs upon grass or other forages or other resources that are high in lignified starch.

» The fresh leaves, tubers and dried vegetation are equally valuable in human to improve daily living, productive society and public healthcare deliver through direct utilization and consumption of sweet potato roots/ tuber in addition to fattening of livestock animal to enhance production as forage, root tuber and dietary bulk

supplement.

» Scientific research and academic demonstrations – cropping and production of sweet potatoes has gained grounds in the recent, especially to facilitate crop yield and products quality as test crop for soil utility and agro-climatology.

Conclusion

Whether in the indigenous or integrated agriculture, the cropping, production, processing and consumption/ utilization of sweet potato is exceptionally gaining global attention from domestic and local utilization in the recent and particularly, now becoming relevant with the advent of tropical organic animal agriculture and No-Chemical-Added livestock husbandry. This is due to the basic challenges of economic competition for grains, especially rice, wheat, millet, sorghum, maize; and other staple tubers like cassava

and yams in human food security and productive society, thereby increasing the feasible threats of animal supplementary feeding.

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