

**Nicaragua Animal Nutrition - Dr. Richard Otto Wiegand**  
**Partners of The Americas - Farmer-To-Farmer Program**  
**Camoapa, Boaco Department**  
**15 May – 1 June, 2009**

**SUMMARY**

Otto Wiegand, University of Wisconsin Extension Agriculture Agent, volunteered to work on dairy cattle nutrition with a Farmer-to-Farmer project in the Camoapa region of Boaco Department in Nicaragua during late May of 2009. He worked with Partners of the Americas staff from Managua in the City of Camoapa in conjunction with the San Francisco de Asis and Masiguito Cooperatives, the ASOGACAM Farmers' Association and the University of Agriculture. Wiegand gave several presentations at the university and a wrap-up seminar at the farmers' association. He visited 14 private dairy farms and four institutional farms.

Major constraints to dairy cattle nutrition included lack of feed and water during the long dry season which extends from December to May, specifically a lack of protein and energy in cattle diets, poor forage and grazing management on many farms, lack of legume forages in particular, lack of stored or purchased feeds, lack of supplements and poor soil condition. Wiegand noted that two native species of trees found in the area, *Gliricidia* and *Leucaena*, legumes widely fed in other parts of the world, are not utilized for forage. Herbaceous or field legumes were also lacking in pastures.

Recommendations for better nutrition included establishment of legumes and improved grasses, tighter grazing rotations, feed supplements, feed storage in the form of silage, hay or pasture stockpiling during the dry season, and use of irrigation. Wiegand further recommended that additional volunteers and / or future local technical staff to be hired cover various areas such as forages, especially legumes, grazing planning, soils, rations, farm finances, reproduction, crossbreeding, milk quality, information technology and farm infrastructure.

**PROJECT SPECIFICATIONS**

**Assignment Purpose**

The main objective of the Farmer-to-Farmer (FtF) program in Nicaragua is to increase the productivity and profitability of the dairy sub-sector, with a secondary objective to examine possibilities for agro-tourism tied to the dairy area. Specific objectives are to (1) improve milk production and quality, and (2) diversify and enhance dairy processing.

The focus of this particular project was to educate participant producers, technicians, university professors, students, and agency personnel in areas related to animal nutrition in the Camoapa region of Boaco Department. Four organizations based in the

City of Camoapa were involved: San Francisco de Asis Cooperative, Masiquito Cooperative, Camoapa Farmers Association (ASOGACAM) and National University of Agriculture (UNA). The majority of producers are dairy farmers and the majority of dairy cattle nutrition is derived from pasture.

The FtF volunteer will also help to identify focus areas for subsequent volunteer assignments. Previous Partners of The Americas volunteers from Wisconsin worked on dairy projects in the Camoapa area from 1996-2003.

### **Expected Results of Assignment**

The volunteer, Otto Wiegand, will assist participants in the learning and application of new techniques leading to improved nutrition of dairy cattle through formal presentations plus on-farm and class discussions in several of the following areas:

- Animal nutrition on pasture
- Ration balancing
- Improving nutrition and forage production during the dry season
- Principles of grazing
- Design of rotational grazing systems
- Selection of alternative forage species including legume trees
- Electric fencing
- Harvest and preservation of silage and hay
- Cost-price decision making for feeds
- Dairy cattle crossbreeding
- General principles of dairy cattle management
- Volunteer experiences and observations from other regions

Information provided by USAID / Farmer-to-Farmer in Nicaragua indicated that average milk production per cow per day is about 4-6 liters, that annual calving rates do not exceed 45%, and that annual cattle mortality is 12.4%. Poor nutrition during the dry season is the major constraint on animal health, production and profitability. Most farmers only milk once a day. Volunteer observations in Camoapa during this project largely support the above facts.

Desired performance indicators for the overall project include a 50% increase in milk production per cow per lactation, an increase in calving rates to 65% each year, a 50% decrease in cattle mortality, selection of model dairy farms employing established improved practices, and an increase in the number of technicians providing assistance to farmers.

### **FARM SITUATION**

The Camoapa farmland is mountainous and very rocky, making the use of mechanized tillage and mechanized establishment of forage difficult if not virtually impossible. Erosion was not discussed, however grazing of hillsides and woodlands, removal of

trees, and poor condition of pastures would be contributing factors. Grass cover is immensely improved during the rainy season. Other than a few patches of cultivation for corn or sorghum or a few orchards, the vast majority of farmland is a mixture of grazed pasture with browsed brush and trees.

The volunteer arrived at the end of the dry season when pastures and cattle were at their worst condition of the year. Pastures on most farms were grazed to the ground. Cattle were thin and bony and would be between 1-2 points on a 5-point body condition score. Milk production was at its lowest with only a few liters per day. Many animals were dried off and some had been sent off-farm sent to highland pastures. To be fair, one should not judge the overall management of the farm and cattle for the entire year based on two weeks at the end of the dry season.

Nonetheless, poor management could be seen in a number of areas. Pastures grazed to the ground at any time is not a good sign. Pastures full of weeds, brush and rocks with little grass were seen too often. Pastures with only native grass or maybe only one introduced species were all too common. With the exception of a few better farms, there was no evidence of stockpiling of ungrazed pasture for the dry season. There were only a few attempts to make silage or hay for the dry season. Although all farms had paddocks, they were too few, indicating continuous grazing and therefore overgrazing. One could tell a lot about management by the attitude of the farmer. One could tell a lot by asking farmers a few basic questions about production, breeding or pasture. Better farmers keep records, at least mental ones. Better farmers are always changing something. Better farmers use artificial insemination and are trying different types of crossbreeding. Better farmers use more paddocks. Better farmers have good grass in at least parts of the farm during the dry season, even at the end of the dry season. Better farmers put up stored feed. Better farmers supplement mineral. Better farmers don't lose cows. Better farmers have enough production to milk twice a day. Better farmers make money and don't complain much.

The majority of dairy cattle are crosses between three common breeds – Brahman, Brown Swiss and Holstein. These are larger animals capable of surviving tougher conditions and producing a lot of milk. Other crosses include Jerseys, Guernseys and in one case observed, Fleckvieh. Pure breeds do not perform well or even survive under conditions of low nutrition, high temperatures, and the long dry season.

Roughly 60% of dairy producers in the Camoapa region market their milk through two cooperatives. This represents over 70% of the milk marketed. Remaining non-member or independent producers market their milk directly or sell their milk to small cheesemakers. One farmer was constructing a hotel / resort on his land and had already built a swimming pool. This may represent eco-tourism or perhaps agro-tourism. Such a venture was discussed on another farm.

## **ANIMAL NUTRITION**

The volunteer gave a presentation at the Agriculture University (UNA) on dairy nutrition on grazing and a brief presentation on Spartan Ration Balancer for Dairy. No one is balancing rations. Balancing or fine-tuning a ration is probably not so important at this time because cows just need more total feed and especially need more energy and protein. Most farmers feed mineral and salt mixed with molasses and top-dressed on cut-and-carry long forage. It is unlikely that mineral is overfed. What ration-balancing can do is point out how much current rations are deficient in supporting higher milk production or body condition. Many cows were so thin that if they were in the US, neighbors would call the police. Obviously Nicaraguan cows will recover condition in the rainy season, but cows in poor condition are not ready to produce milk when the rains come, cannot produce much milk, are vulnerable to disease and parasites, do not breed, do not live as long and do not produce much meat. Some farmers don't even bother to market cull cows, just eat them, give them to employees or dispose of them in other ways.

Average milk production is 4-6 liters per day, higher in the rainy season and lower in the dry season. There is an annual milk production contest where one farmer has gotten 45 liters per day from one cow. Surely some or perhaps many of the cows have the genetics to produce that much, so why not feed all cows better. The price of milk in the rainy season may be 3-5 cordobas per liter (about \$0.75 per gallon or under about \$8.60 per hundred lbs.) and may be as high as 15-20 cordobas per liter in the dry season (over \$3 per gallon or about \$35.00 per hundred lbs.) The current milk price to the farmer in the US is about \$12 per hundred lbs. Dry season milk prices should be a high enough incentive for Nicaraguan dairy farmers to work harder, borrow money, improve rotations, stockpile dry season forage, establish better forages, use irrigation, make silage, make hay, or buy feed supplements to produce more milk. Additionally, there should be plenty of incentive to cool milk on the farm and in the truck. One of the cooperatives reduces the milk grade / price for each two hours of transport time from the farm to the processing plant. Milk cooling and cold transport have been the focus of previous volunteer projects.

## **ELECTRIC FENCE**

One of the focuses of this project was electric fencing. Some farmers are using it with solar or battery power. There is no electric service to rural areas around Camoapa. Main reasons for using electric fence in the US are to save money by using less wire, ability to reduce paddock sizes for tighter rotations, and ability to remove interior fences for mechanized hay or silage making. Farmers in Camaopa are unlikely to use large machinery to make hay or silage at this time. Most paddocks are large, averaging five manzanas (8 acres), and are surrounded by living fences (small trees with wires stapled to them). However, living fences, once established, are growing trees that cannot be easily removed. Certainly farmers can save money by using less wire, but the energizer, solar collector, batteries and lightning mitigation are cost or management

challenges that many farmers may not overcome. Current paddocks are often square or pie-shaped, not lending themselves to smooth movement of temporary wires down long horizontal fields. Pastures have very low productivity, therefore grazing distances and amounts of electric wire needed are still great. Provision of water to paddocks, if deemed necessary, is another challenge. The highest priority is to reduce paddock size and rest pastures to full recovery, whether by temporary electric fencing, permanent fencing or faster rotations of existing paddocks. Electric fencing is very useful, but may not be practical in all situations.

## **FARM VISITS**

On many farms, there was no clear distinction between grazed grassland and grazed woodland. Much grazing is under low-density tree cover. Perhaps 1/3 of the land on farms visited was forest or very minimal grazing. Grazing is therefore mixed with browsing. Cattle are natural grass-eaters, but will eat forbs, leaves from brush and trees, and various types of tree pods or fruits to get the nutrients they need. Possibly 95% of utilized land seen on the farms was pasture. There were a few fields of maize, sorghum, citrus, cocoa, coffee or other planted crops.

The information in the table below was collected during farm visits and follow-up discussions with technicians. The average dairy producer visited had 34 milking cows, 112 manzanas of total land (1 manzana = 0.7 hectares or 1.7 acres) of total land, an estimated 76 manzanas of utilized land, and 15 grazing paddocks. Youngstock numbers were not collected. The average grazing paddock size was 5 manzanas. Most farms had a bull and a few horses and donkeys. Many cows were thin and weighed under 450 kilos (1000 lbs.) even though their genetics was largely made up of three larger breeds, Brahman, Brown Swiss and Holstein.

<b>Farm Visit</b>	<b>Dairy Cows</b>	<b>Manz -anas</b>	<b>Rota- tions</b>	<b>Notes</b>
Coop San Francisco	6	70	4	Institutional farm, electric fence
Coop. Masiguito	0	70	5	Institutional farm
Farmers Association	0	70	4	Institutional farm, electric fence
Agriculture University	10	70	8	Institutional farm
Dr. Elmundo Robleto	40	80	25	Irrigation, several grasses, adding rotations, AI
Francisco Lopez	20	140	15	
Armando Fernandez	40	120	20	Several grasses
Luis Marengo	60	140	20	AI, several grasses, transplant bed, silage, best pasture seen
Guillermo Marengo	12	50	6	Few rotations
Eladia Perez	6	27	7	Pond, vampire study
Miguel Angel Sosa	15	120	12	
Armando Fernandez	20	200	25	Second farm, bull, swimming pool, resort
Dagaberto Dias	16	44	12	Shown on TV, added rotations, electric fence,

				citrus, mani forajero
Ernesto Miranda	100	140	15	Record-producing cow contest = 45 liters / day
Wilder Rodriguez	26	120	18	Sheep also
Martha Fagardo	50	120	15	
Dr. Enrique Aragon	50	56	32	Electric fence
Timoteo Hurtado	25	200	24	Planted wood and fruit trees
		-500		Estimated forest or very minimal grazing
Producer (14) ave.	34	76	15	Institutional farms not included

Under typical rotational grazing schemes for dairy cows in more developed areas, the number of paddocks should average 30-40, the size of paddocks would depend on number of cows but may be ½ manzana (1 acre) or less for a herd of 50 cows, and cows would be moved at least once a day, if not twice.

### **FORAGE TYPES**

Information on the forages in the table below was collected on the Camoapa farm visits. Scientific names were added. The common and often only type of established pasture for grazing is Brachiaria. Brachiaria is a durable grass grown on marginal soils in the tropics. A number of cut & carry (pasto corte) grasses are grown on small parcels for hand harvest. A few farmers make silage in concrete pits for dry season feeding. A few make dried hay bales using a packing box (paca). One farmer used irrigation on his cut & carry forages grown in smaller bottomland areas.

There were a number of surprising observations. One was the lack of variety in the grass mix for grazing. Apart from Brachiaria and unnamed native grasses, there was only farmer that had stargrass, commonly grown in the tropics. Rhodes grass and setaria were not seen, although they are often established where stargrass is grown. Kikuyu grass is also common in some countries, but needs higher altitudes (>1,500 m). The altitude in Camoapa is about 600 meters.

There were no legumes in the mix, even though legumes typically comprise 10-25% of grazing in many climates. Legumes grow well in poor and eroded or disturbed soils, often preceding the return of grasses in marginal areas. Legumes fix nitrogen in the soil, often removing the need to apply extra nitrogen fertilizer. Legumes provide much-needed protein in the diets of ruminant livestock. Grasses often contain less than 15% protein and less than 10% when mature. Legumes typically exceed 25%. Good legumes will replace the need for soybean or other protein supplements.

Another surprise was the lack of use of tree legume forages. Two famous tree legumes are native to Central America or the Caribbean - Leucaena and Gliricidia. Leucaena was found at the University farm in Camoapa and can be seen in the wild. The local word for Leucaena in Mexico is "Oaxaca," the name of the large city in the south. Leucaena is the most widely-used tree forage in the world, grown extensively in the

Phillipines, Indonesia, SE Asia, East Africa, Australia and Hawaii. Gliricidia, called “madero negro” (blackwood) in Nicaragua, grows everywhere and is used to make living fence posts. It has been studied in Cuba (Dr. Redimio) and is used widely in the Caribbean as forage. It may be the second or third most used legume tree forage in the world, the other being Sesbania, studied by the volunteer for his doctorate. Neither Leucaena nor Gliricidia is fed in Camoapa. It is recommended that each tree forage be analyzed first for tannins and potential toxins, but at reasonable levels in a dairy diet (<30%), neither should cause any problems.

Common Name	Scientific Name	Use	Notes
Native grasses		Grazed	Various, not identified
Native brush		Browsed	Various
Brachiaria – grass (general)	<i>Brachiaria brizante</i>	Grazed	
Brachiaria v.Toledo	<i>Brachiaria brizante</i>	Grazed	
Brachiaria v.Tanzania	<i>Brachiaria brizante</i>	Grazed	
Para caribe	<i>Brachiaria mutica</i>	Grazed	
Sorgo forajero -	<i>Sorghum spp.</i>	Cut & carry	Sorghum
Maize - corn	<i>Zea mays</i>	Cut & carry	Not seen?
Sorgo sudeno	<i>Sorghum spp</i>	Cut & carry	Sorghum-sudan cross?
King grass / Pasto Cuba	<i>Pennisetum purpureun</i>	Cut & carry	Napier, elephant grass?
Taiwan grass	<i>Pennisetum purpureun</i>	Cut & carry	Napier, elephant grass?
Cana dulce	<i>Saccharum spp.</i>	Cut & carry	Sugarcane
Cana dulce v. Guatemala	<i>Saccharum spp.</i>	Cut & carry	Sugarcane
Pasto estrella - grass	<i>Cynodon dactylon/spp.</i>	Grazed	Stargrass
Guasimo - legume	<i>Guazuma ulmidora</i>	Browsed	Tree pods browsed
Mani forajero	<i>Arachnis pintoii</i>	Grazed	Peanut family legume
Leucaena – tree legume	<i>Leucaena leucocephala</i>	Not used as forage	Tree forage, native, used worldwide
Madero Negro – tree legume	<i>Gliricidia sepium</i>	Living fence, not used as forage	Tree forage, native, used regionally
Guanacaste	<i>Enterolobium cyclocarpum</i>	Tree pods browsed	
Albizia	<i>Albizia saman</i>	Not browsed?	Seen in country, can be confused w/ Guanacaste
Helequeme - tree legume	<i>Erythrina poeppigiana</i>	Browsed	Tree leaves, pods?
Rhodes - grass	<i>Chloris gayana</i>	Not found	Potential?
Setaria - grass	<i>Setaria sphacelata</i>	Not found	Potential?
Panicum v. Guinea grass	<i>Panicum maximum</i>	Not found	Potential?
Kikuyu - grass	<i>Pennisetum spp.</i>	Not found	Needs higher altitudes
Desmodium - legume	<i>Desmodium spp.</i>	Not found	UNA professor knew of it
Chickpea - legume	<i>Cicer arietinum</i> , other	Not found	Mentioned in country

(garbanzo)			
Cowpea - legume	<i>Vigna sinensis</i> , other	Not found	
Alfalfa - legume	<i>Medicago sativa</i>	Not found	Probably would not survive dry season
Clover - legume	<i>Trifolium repens</i> , other	Not found	Probably would not survive dry season

## **EXTENSION SERVICES**

Formal government or university extension services do not exist in Camoapa. Extension to over 700 dairy farmers in the area is provided by only four cooperative technicians. Some assistance is also provided by UNA staff. Cooperative meetings, some formal classes and farm visits are the main venues for extension-type services. Communication by cellular phone is common. Computers are largely non-existent in rural areas. The cooperative, farmers association and university farms should be a good examples of a well-run farms, but have few cows and do not appear to be managed any better than the average farm in the area.

## **RECOMMENDATIONS FOR DAIRY FARMERS**

The following recommendations were given at the wrap-up report in Camoapa. Most of the discussion for these areas is included in the text of this report.

1. Improve dry season dairy cattle nutrition
2. Use tighter pasture rotations
3. Add legumes to the forage mix
4. Use supplemental feeds
5. Use improved cow and pasture management techniques
6. Additional technical specialists recommended for cooperatives

## **RECOMMENDATIONS FOR TECHNICAL SUPPORT**

The Camoapa agricultural community, including the two cooperatives, farmers association, university and independent producers, would benefit from the immediate provision of technical or extension services in the following areas:

1. Animal nutrition, including ration balancing at some point
2. Forage agronomy including tree forages, plus soil services, control of brush and weeds
3. Grazing planning
4. Dairy cattle reproduction and genetics
5. Farm business and financial management

The fact that three of the four cooperative technicians are veterinarians is an indication that curative rather preventative services are the priority. However, better animal

nutrition with better forage and soil condition could lessen the need for veterinary services. Dairy farmers would greatly benefit from any practices that could improve dry season production when the price of milk is much higher, milk cooling and the need to milk cows twice a day. At some point, soil and forage sampling services should be more available to farmers.

## **FUTURE FARMER-TO-FARMER ASSISTANCE**

There are several areas where additional volunteers would be needed related to the project in Camoapa, not unlike the recommendations above for additional technical support:

- Extension information technology and organization
- Soils, fertility and erosion control
- Forages focusing on improved grasses, field legumes and tree legumes
- Milk quality and delivery
- Reproduction, artificial insemination and crossbreeding
- Grazing planning
- Farm business planning
- International sources for funding, technology and education
- Farm buildings, water, irrigation and other infrastructure
- Eco-tourism

## **CONTACTS AND AGENCIES**

Ronald Blandon Bustamente – Coordinator, FTF Program  
Elisa Estrada – Field Officer, FTF Program  
Dr. Juan Rafael Granjo – Vet. Technician, San Francisco de Asis Cooperative  
Dennis Rivera – Gerente, San Francisco Cooperative  
Armando Fernandez – Director, San Francisco Cooperative  
Dr. Elmundo Robleto – Treasurer, San Francisco Cooperative, and farm owner  
Ing. Nestor Espinoza – Professor of Zootechnology, Nat. University of Agriculture (UNA)  
Ing. Kelvin Cerda – Professor of Plant Pathology, UNA  
David Penalba - Professor of Computer Science, UNA  
Samuel Tablada – Professor of Chemistry and Agronomy  
Luis Guillermo Hernandez – Director and Professor of Zootechnology, UNA  
Katlin Sequeira – Librarian  
Lillian Esther Arceda Medina – UNA Student  
Jislen Diaz Flores - UNA Student  
Jhacel Salazar Miranda – UNA Student  
Juan Raul Fernandez Arroliga – UNA Student  
Lester Manuel Lazo Miranda – UNA Student  
Horacio Antonio Duarte Murillo – UNA Student  
Jose Tomas Suarez – Rural Extension Agent, INTA

Ing. Jose Alexander Rodriguez Diaz – Technician, Masiguito Cooperative  
Dr. Erick Aburto Aregon – Vet. Technician, Masiguito Cooperative  
Dr. Jonathan Antonio Barguero Valle – Vet. Technician, Masiguito Cooperative  
Tomas Espinoza - Gerente, Masiguito Cooperative  
Martha Fagardo – Gerente, ASOGACAM Farmers Association of Camoapa  
Dr. Enrique Aragon – President of ASOGACAM Farmers Association

### **TIMETABLE OF WORK**

Fri. May 15 – Arrival in Managua, night at Las Mercedes Best Western Hotel

Sat. May 16

AM – move to hostel, tour of Managua, work at home

PM – orientation meeting with Ronald Blandon and Elisa Estrada at Catarina Village on Norome Crater Lake

Sun. May 17

AM – Work at home

PM – Discussion of project materials, tour of Managua, visit to Ronald's office

Mon, May 18

AM – Visit to Nicaragua Partners office in Managua with Elisa Estrada

AM – Visit to Peace Corps office (staff were in a meeting)

AM - Travel to Camoapa

PM – Meeting at San Francisco de Asis Cooperative with staff of San Francisco, staff of Masiguito Cooperative, representative of the Asogacam Farmers Association and students from UNA, the National Agriculture University (20 persons)

PM – Visit to UNA (10 persons)

PM – Visit to San Francisco Cooperative farm (10 persons)

Tues, May 19

AM – Visit to farm of Dr. Elmundo Robleto and Luz Marina Mora, lunch at farm (15 persons)

PM – Visit to San Francisco Cooperative farm, sick cow (10 persons)

Weds, May 20

AM – Presentation on cattle parasites at San Francisco Cooperative by Dr. Guillermo Pizzaro Diaz, LaQuinsa Company, Costa Rica (15 persons)

PM – Visit to first farm of Armando Fernandez (8 persons)

PM – Meeting at hotel with Ronald Blandon, representatives of San Francisco and Masiguito Cooperatives, and head of Farmers Association (8 persons)

Thurs, May 21

AM – Visit to farm of Luis Marengo (8 persons)

AM – Visit to farm of Guillermo Marengo (10 persons)

AM – Visit to farm of Eladia Perez (9 persons)

PM – Hotel, preparation of presentations

Fri, May 22

AM – Four presentations to UNA class - cattle nutrition on pasture, electric fences, work photos from Honduras/Guyana, and Wisconsin grazing

- (40 persons)  
PM – Hotel, work on Farmer-to-Farmer report
- Sat, May 23  
AM – Visit to farm of Michael Angel Sosa (9 persons)  
AM – Visit to second farm of Armando Fernandez (9 persons)  
AM – Visit to proposed tourist hotel/resort of Armando Fernandez (9 persons)  
PM – Hotel, work on Farmer-to-Farmer report
- Sun, May 24  
AM/PM – Work in hotel, invited out for dinner
- Mon, May 25  
AM – Visit to Masiguito Cooperative  
AM – Visit to farm of Dagoberto Villas (9 persons, part on TV later)  
AM – Visit to farm of Ernesto Miranda (9 persons)  
AM – Visit to Santa Fe Foot Bridge  
PM – Presentations by Otto Wiegand on Feedval, Spartan, Financial Indicators, Cost Summaries from Honduras, Cow-Flow Spreadsheet, Farm Business Planning (15 persons)
- Tues, May 26  
AM/PM - Program cancelled, work in hotel
- Weds, May 27  
AM – Visit to farm of Wilder Rodriguez (5 persons)  
PM – Visit to farm of Martha Fagardo (4 persons)  
PM – Distance visits to Masiguito Cooperative Farm, UNA Farm and Farmers Association Farm (3 persons)
- Thurs, May 28  
AM – Visit to farm of Dr. Enrique Aragon (4 persons)  
AM – Meeting with Juan Raphael Granjo at San Francisco Cooperative  
AM – Visit to farm of Timoteo Hurtado (3 persons)  
PM – Work on wrap-up presentation and report in hotel
- Fri, May 29  
AM – Wrap-up presentation at Farmers Association (67 persons)

## **REFERENCES**

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