

Using the Innovation Platform Approach to enhance adoption of agroforestry practices for sustainable land management

Project Report

Bernard Fungo, Isaac Kiyangi, Charles Galabuzi, Jude Sekatuba, Susan Nansereko, Kenneth Eryau and Hilary Agaba



**National Forestry Resources Research Institute (NaFORRI),
National Agricultural Research Organization (NARO),
P. O. Box 1752, Kampala, Uganda**

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ABSTRACT

The overall objective of the study was to enhance adoption of sustainable land management practices using the innovation platform (IP) approach. To this effect, an IP was initiated in Bugobero sub-county, Manafa district, to address the soil erosion challenge while another was initiated in Nakitoma sub-county, Nakasongola district, to address the degradation of savanna woodlands.

The Nakitoma innovation platform identified the use of ISSB energy saving cook stoves and establishment of bioenergy woodlots as potential sustainable land management (SLM) practices to address the challenge of deforestation in the savannah woodlands of Nakasongola District. The IP established six *Melia volkensii* bio-energy demonstration to promote adoption of woodlots for sustainable management of savanna woodlands. The IP expressed preference for *Melia volkensii* because it is a drought resistant, termite resistant and relatively fast growing tree species.

The Nakitoma IP also distributed 200 ISSB cook stoves to nine farmer groups through an experimental protocol. ISSB stove performance was found to be 28 MJ/capita energy consumption compared to 56MJ/capita with three stone stove after running a Kitchen Performance Test (KPT). Whereas daily fuel use was 2.8kg/capita ($\approx$ 4.6 kg/household) compared to 8.5kg/capita with three stone stove. This indicates that ISSB stove can reduce fuel wood consumption by 67% if replaced with a three stone stove.

In Bugobero sub-county, a 9-member IP committee has been established. Training of the 9 members of the IP committee, 15 local leaders and 300 farmers has been conducted. A total of 4,000 meters of contour bands were established in the Khabungu micro-catchment in Bugobero Sub County. Approximate 1000 seedlings of *Gravaria* and about 6000 of *Calliandra* have been planted along the contour bands to stabilize as well as provide additional benefits such as fodder and timber. Guidelines for formulating by-laws to ensure maintenance of established erosion control structures have been developed. Baseline data has collected on household-level and relevant stakeholder characteristics and databases developed.

Important to note is that we did not establish the effectiveness of IPs for soil erosion control in the eastern highlands and reforestation in the central rangelands because the project was terminated prematurely before conducting the endline survey.

Some of the key recommendations for improving the use of the innovation platform approach in enhancing adoption of sustainable land management included:

- Writing research for development projects needs to take a stakeholder consultative approach in order to establish facts including technologies or

practices, values, rules or by-laws (especially the un-documented ones) in the targeted areas of operation.

- Soliciting for local political support is a prerequisite for establishing an effective innovation platform.
- Working within already existing platforms including community based organization, farmers and resource user groups is a more favorable or effective approach than starting from scratch or forming a completely new platform.
- Studying the community activity calendars is vital during planning and implementation of project activities. Deliberate plans should be put in place to obtain, study and seriously consider them before implementing activities.

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LIST OF ABBREVIATIONS AND ACRONYMS

SLM	Sustainable Land Management
IP	Innovation Platform Approach
ISA	Innovation Systems Approach
ARD	Agricultural Research and Development
RCD	Root Collar Diameter
KPT	Kitchen Performance Test

1.0 BACKGROUND

The Innovations Systems Approach (ISA) has been proposed as a feasible way to link critical actors to identify and implement efforts to address community challenges (Adekunle *et al.*, 2013). The Innovation Platform (IP), which forms the central tenet of the ISA, is a coalition, collaboration, partnership and alliance of agricultural research and development (ARD) actors (that is, public and private scientists, extension workers, representatives of farmers, farmers' associations, private firms and non-governmental organizations, and government policy makers). These actors communicate, cooperate and interact to set priorities, develop concepts and plans to promote agricultural productivity and profitability (Tenywa *et al.*, 2011). This is because increasing agricultural productivity supported by appropriate policies and markets without doing harm to the natural resource base can help improve the welfare of all members of society.

It is envisaged that when the aforementioned actors work together as an IP, the benefits are greater than the aggregate of the individual actors working separately. This approach was used successfully to control Banana Bacterial Wilt in western Uganda. However, its effectiveness in addressing sustainable land management problems is not fully understood. Using the eastern highlands and central rangelands of Uganda as case studies, this project assessed the effectiveness of the IP approach to enhance the adoption of sustainable land management practices in the two contrasting farming systems. The two areas have different land degradation challenges and need to use appropriate options to address the challenge at hand.

The eastern highlands sub zone is characterized by severe soil erosion due to the steep slopes. This zone has been most affected by deforestation due to the topographical complexity and altitudinal gradients. The conversion of forests to agricultural cropland on steep slopes has exacerbated soil erosion, sedimentation of river systems and landslides in the districts of Sironko, Manafwa, Mbale, Bududa and surrounding districts. The deposition of eroded sediment in the river systems has also impaired the quality of drinking water downstream (Barungi *et al.*, 2013). Land degradation caused by soil erosion is also a major threat to the sustainability of agriculture in the region, even with increased applications of fertilizers (Barungi *et al.*, 2013; UNEP, 2015).

Similarly, the central rangelands face severe deforestation due to charcoal burning to meet demands of the increasing urban and peri-urban population. The high deforestation rate has also caused an acute shortage of wood products such as timber, poles and fuel wood in the central rangeland districts of Nakasongola and Nakaseke. The scarcity of fuel wood has increased the average distance travelled by women and children in search of fuel wood to 7 kilometers (Egeru *et al.*, 2014). Woody biomass is the dominant energy resource for households and small and medium scale industries such as brick making. It is estimated that 92% of Uganda's energy needs are met from

woody biomass (MWE, 2013). Although some efforts have been made to promote agroforestry technologies in Uganda, adoption of these technologies is still very low.

2.0 OBJECTIVES

2.1 Overall objective

To enhance adoption of sustainable land management practice using the innovation platform (IP) approach

2.2 Specific objectives of the study

1. To establish functional Innovation Platforms for implementing collective action for soil erosion control in the eastern highlands and reforestation in the central rangelands.
2. To assess the effectiveness of IPs for soil erosion control in the eastern highlands and reforestation in the central rangelands.
3. To document lessons and experiences from using the innovation platform to enhance the adoption of agroforestry technologies for sustainable land management.

3.0 RESEARCH APPROACH

Following a reconnaissance survey in the Eastern highland districts, Butobero sub-county in Manafa district was selected for establishment of an innovation platform for controlling soil erosion. Similarly, an innovation platform for reforestation of degraded central rangelands was initiated in Nakitoma sub-county, Nakasongola district.

A baseline survey of sustainable land management (SLM) practices was conducted in the identified IP action sub-counties of Nakitooma, in Nakasongola district and Bugobero, Manafwa district. The purpose of the baseline survey was to benchmark intervention adoption levels of sustainable land management practices in the IP action and control (counterfactual) sub-counties. The baseline data is crucial in establishing the effectiveness of the IP approach in enhancing adoption of SLM technologies after conducting an endline survey.

An IP was initiated in Bugobero sub-county to address the soil erosion challenge while another was initiated in Nakitoma sub-county to address the degradation of savanna woodlands. Comparison of intermediate development outcomes would be conducted using the double difference approach.



Figure 10: NaFORRI team meeting IP committee members at Nakitoma sub-county.

4.0 OUTPUTS

4.1. Nakitoma IP for restoration of degraded savanna woodlands

The Nakitoma innovation platform identified two potential sustainable land management (SLM) practices to address the challenge of deforestation in the savanna woodlands of Nakasongola District. The sustainable land management practices included the use of ISSB energy saving cook stoves and establishment of bioenergy woodlots.

4.1.1 *Melia volkensii* bio-energy demonstration woodlots

A total of six *Melia volkensii* bio-energy demonstration woodlots were established on 10 acres in Nakitoma sub-county. The purpose of the bio-energy demonstration woodlots was to promote adoption of woodlots for sustainable management of savanna woodlands. Adoption of bio-energy woodlots is expected to reduce pressure on the savanna woodlands by providing an alternative source of fuelwood. During the IP initiation workshop, participants expressed preference for drought resistant, termite resistant and relatively fast growing tree species for the bio-energy woodlots. *Melia volkensii* is one of the species that were proposed by the IP. Several farmers provided land for establishment of the bio-energy demonstration woodlots, as indicated below.

Table 1: Bio-energy demonstration woodlot host farmers

No.	Name	Acreage (acres)	Contact
1	Senyimba Richard	3	0702540363/ 0788961570
2	Mutagubya Christopher	2	0782716452
3	Mugenyi Geoffrey	3	0782940065/0700873707
4	Katwesige Naboth	1	0782268191
5	Bukeera Peter	0.5	0774714077
6	Lwolekya Moses	0.5	0774980087

Due to prolonged droughts in Nakasongola District, the use of bottle drip irrigation for enhancing juvenile tree survival was also demonstrated in the bio-energy woodlots.



Figure 11: Growth performance of *Mellia volkensii* in Nakitoma sub county, Nakasongola district: Left+Middle-Demonstrating bottle drip irrigation to host farmers; Right-*Mellia volkensii* woodlot at six months

Growth performance of *Melia volkensii* was measured at 6 months: (mean tree height of 1.32 ± 0.7 meters, mean root collar diameter at 2.56 ± 0.69 cm, mean diameter at 10 cm from RCD at 2.38 ± 0.7 cm). Overall, the trees showed very good juvenile growth performance at 6 months.

The impressive growth performance of *Melia volkensii* in the demonstration woodlots has generated public interest in adopting the tree species. Even after buying 20,000 seedlings of *Melia volkensii* from Kifu tree nursery, it was not enough to meet the demand of Nakasongola farmers in this planting season. We are also receiving more inquiries about the species from other districts such as Nakaseke, and Luweero.

4.1.2 ISSB stove trial

The IP committee had earlier included energy saving cook stoves among the SLM practices to be disseminated to farmer groups in Nakitoma sub-county. The purpose of the energy saving stoves is to contribute to reduced deforestation of the savanna woodlands by reducing the rate of fuelwood consumption.

An experiment to assess the performance of ISSB stoves was set up in Nakitoma sub-county using the IP approach. The experiment involved the construction and distribution of 200 ISSB cook stoves to nine farmer groups including; Nongo Bugarama savings and farmers' group, Mukama mwesigwa njeru women's saving group,

Kwagalana saving and credit group, Agali awamu group, Akalya amagwa credit saving and farmers' group, Dembelyo village saving and loan association, Kigweli youth development group, Kasozi tuveyo farmers' group and Kasozi development organization.



Figure 12: Production and promotion of energy-saving stoves: Left-Machine operators making interlocking blocks for the energy saving stoves; Middle and Right-Mr. Yona Turinayo explaining how to use the ISSB energy saving stove to members of Nongo-Bugalama saving and farmer's Group

One year after distributing the stoves, a household survey was conducted using kitchen performance test (KPT) experimental protocol and a questionnaire, to assess the perceptions and performance of the ISSB stove. The questionnaire survey and KPT were conducted among farmers in Nakitoma sub-county who received and are using the ISSB stove. A total of 120 respondents were randomly selected from Dembelyo, Kigweri youth development and Agaliwamu farmers groups.

The KPT was used to measure household fuel consumption. Daily measurements of fuel consumption were made in a representative sample of households using traditional stoves and ISSB cook stove over an extended period of time 6 days. Because fuel consumption is weighed directly, the KPT is the preferred method of quantifying the ICS's impact on household fuel use.



Figure 13: Measuring household fuel consumption in Nakitoma, Nakasongola district; Left-Fuel weighing on a spring balance during KPT; Middle-Determination of moisture content; Right-Moisture meter (Protimeter Mini BLD2000)

ISSB stove performance was found to be 28 MJ/capita energy consumption compared to 56MJ/capita with three stone stove after running a Kitchen Performance Test (KPT). Whereas daily fuel use was 2.8kg/capita ($\approx$ 4.6 kg/household) compared to 8.5kg/capita with three stone stove. This indicates that ISSB stove can reduce fuel wood consumption by 67% if replaced with a three stone stove.

Households were asked a series of questions in order to understand their perception of ISSB stove. According to the average rating of performance attributes (Figure 6), the ISSB stove was rated better than Lorena and three stone stove in terms of reducing fuel wood consumption, cooking fast, cooking well, producing less smoke, portability, ability to use multiple fuels and not damaging sauce pans. However the three stone stove was rated better in terms of affordability and availability.

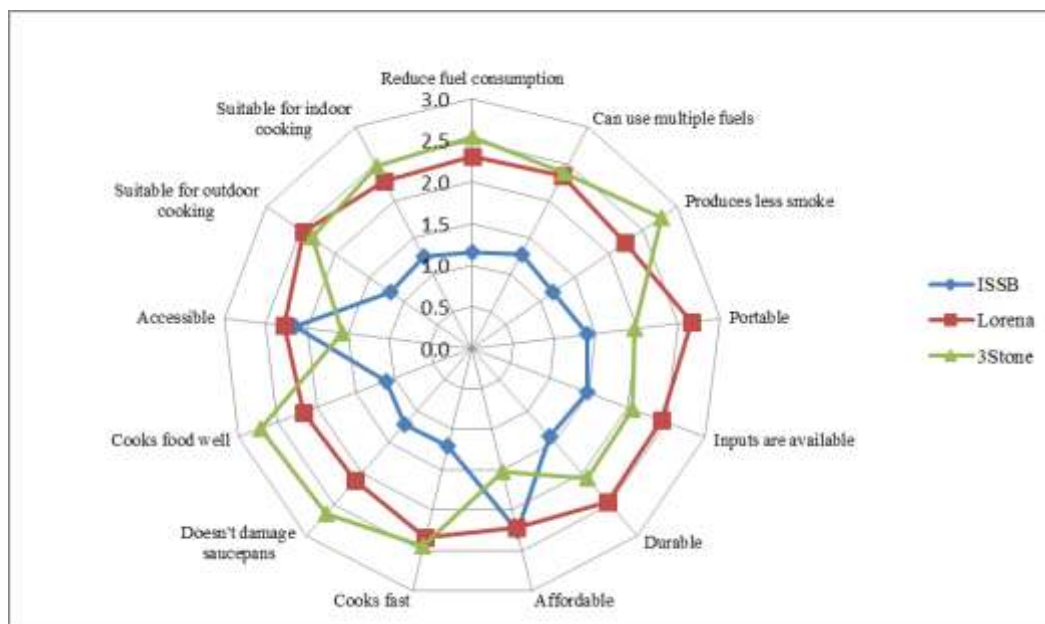


Figure 14: Radar chat showing average rating of performance attributes across ISSB, Lorena and three stone stove

Key perceptions summarized from the focus group discussions.

Advantages of ISSB

1. Once lit the fire keeps burning for a long time thus giving the user time to rest when preparing food.
2. They are less smoky than the 3 stone stove.
3. They cook faster than the 3 stone and the Lorena stove.
4. It can use multiple fuels (firewood, charcoal, maize kobs)
5. ISSB stoves save fuels (are very economical in terms of firewood, charcoal and other fuels)

Some of the identified advantages of ISSB include (They are less smoky, cook faster, save fuel, can use multiple fuels)

Disadvantages

1. They not locally available and hence not accessible (not easy to get when needed)
2. Not suitable for preparing some food like posho and millet/karo.
3. Not suitable for small sauce pans
4. ISSB stove occupies a large space and hence making them not suitable for people who rent

4.2 Bugobero IP for soil erosion control in eastern highlands

The main activities accomplished during this component were (i) establishment an IP and capacity building of 300 farmers, 15 local leaders, 9-member IP committee of the Innovation Platform (IP) for controlling soil erosion in Khabungu micro catchment (ii) Establishment and maintenance of 4,000 meters of contour bands for demonstration landscape-level soil erosion control.

4.2.1 Establishment of the IP

Similar to the process conducted in Nakitoma, an initiation meeting was conducted in Bugobero at Bugobero sub county community hall. A steering committee for the IP elected, a tentative work plan for subsequent meetings was developed. Furthermore, potential SLM practices and where they could be located within the sub county, as proposed by IP steering committee, were identified. The IP committee was henceforth charged with the responsibility to run the day-to-day activities of the IP.



Figure 15: Local government leaders giving opening remarks at the IP initiation meeting in Bugobero sub county, Manafa district. A: District Production officer, Modesta Nambuya addressing the congregation and Right, stakeholders electing IP committee

4.2.2 Stakeholder Analysis

In both Namabya and Bugobero sub counties, a tour of the sub county offices aided enrichment of the contacts of the various stakeholders. In total, we were able to identify

and invite 60 stakeholder representatives in each of the two sub counties to the meeting. The meetings took place at the sub county hall. A total of 120 respondents (60 from each sub county) participated in the assessment.



Figure 16: The process of stakeholder analysis in Manafwa district: A-One member of the research team translated the questions to participants; B-Participants consult each other on how to complete the tool; C-Facilitator (Right) helps some of the participants where an issue was not clear.

4.2.3 Capacity building of IP actors

Following the establishment of the IP committee, capacity building of stakeholders on various aspects of IP process were conducted. The key sessions conducted included (i) the concepts of value chain in agriculture (ii) development of business plans as a major component of IPs and participatory monitoring and evaluation.



Figure 17: Participants listening to a contribution from a members during one of the training sessions in Bugobero sub county community hall.

4.2.4 Collective action for landscape-level erosion control

Establishment of the contour bands involved digging trenches of approximately 30-50 cm deep and approximately one meter wide. Within the bands, boulders are collected from the garden on the up-slope side and stacked into the band to stabilize them. During the rainy season, the lower side of the bands was planted with either elephant grass or short-rotation fodder shrubs, mainly *Callindra*, in addition to *Greveria rubusta*. A total of 4000 meters of contour bands were established in the Khabungu microcatchment in Bugobero Sub County.



Figure 18: Participatory establishment of contour bands for soil erosion control in Bugobero sub county, Manafwa district

5.0 DOCUMENTING EXPERIENCES AND LESSONS

A technical report titled “*Experiences and Lessons from the SLM Project in the Eastern Highlands and Central Rangelands of Uganda*” has been produced. The report makes recommendations for improving the innovation platform approach in enhancing adoption of sustainable land management.

6.0 ASSESSING THE EFFECTIVENESS OF IPS

A baseline survey of sustainable land management (SLM) practices was conducted in the identified IP action and control sub-counties in Nakasongola and Manafwa districts.

Baseline survey of forestry SLM practices in Nakasongola district indicated (Figure 10) that about two thirds (70%) of households in Nakitoma had knowledge on farmer managed natural regeneration, woodlots (43%), energy saving stoves (49%), charcoal briquettes (10%) and silvopastoral system (22%) whilst in kakooge, 15% had knowledge on farmer managed natural regeneration, woodlots (28%), energy saving stoves (51%), charcoal briquettes (13%) and silvopastoral system (11%).

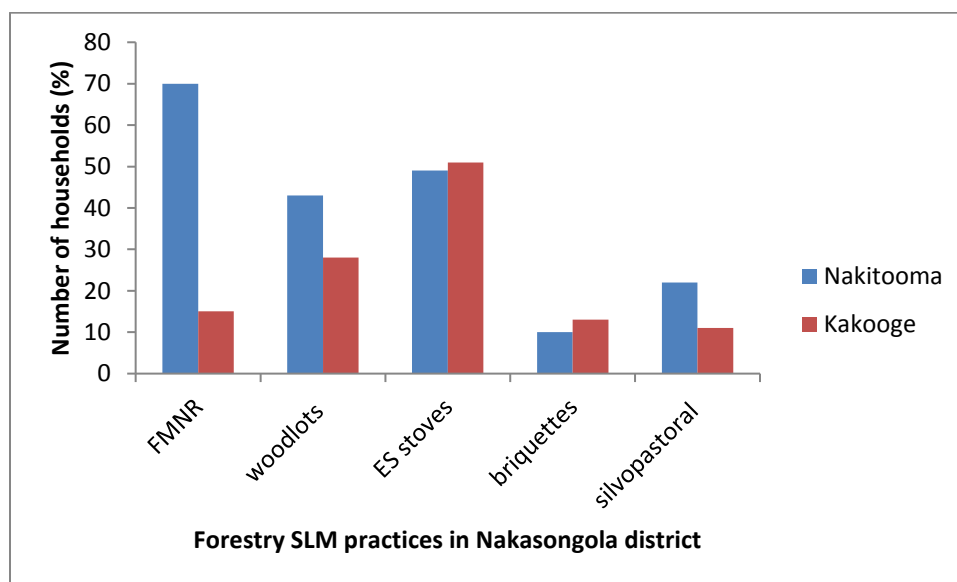


Figure 10. Baseline knowledge of forestry SLM practices in eastern highlands of Uganda

In terms of use of forestry SLM practices, about (4%) of households in Nakitoma used farmer managed natural regeneration (Figure 11), woodlots (8%), energy saving stoves (5%), charcoal briquettes (1%), silvopastoral system (9%) while 73% did not use any of the above SLM practices. In kakooge, 2% of households used farmer managed natural

regeneration, woodlots (7%), energy saving stoves (5%), charcoal briquettes (0%) and silvopastoral system (7%) while 79% did not use any of the above SLM practices.

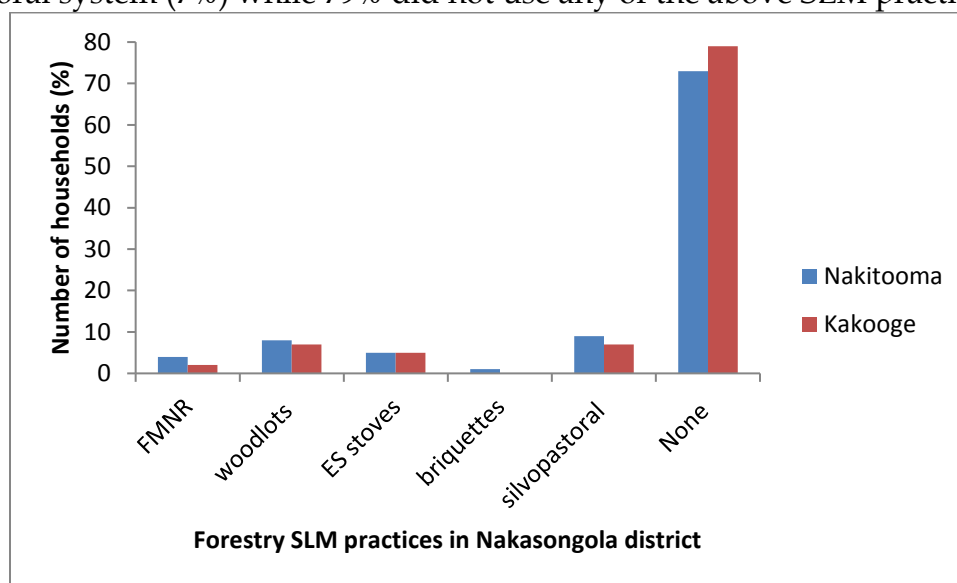


Figure 11. Baseline use of forestry SLM practices in Nakasongola district

However, we did not establish the effectiveness of IPs for soil erosion control in the eastern highlands and reforestation in the central rangelands because the project was terminated prematurely before conducting the endline survey.

7.0 WAY FORWARD

7.1 Exit strategy developed

Following the termination of the project in July 2017, an exit strategy was developed to ensure smooth withdrawal but continued progress towards maintaining the already established processes. The strategy involve;

- Holding discussions with community in the concerned micro-catchment (Khabungu), together with the IP leadership, to discuss how to ensure maintenance of the contour bands by individuals plot farmers in the catchment
- Agreed on the possibility of establishing and maintaining a community nursery by local partners such as BugiZARDI and “Mbale Coalition Against Poverty” (Mbale CAP) and sub county and district leaders. Mbale CAP is participating in the Trees for food security Project and could be helpful in promoting establishment of community Nursery
- Held discussion with SLM Specialist for BugiZARDI for possible inclusion of Bugbero sub county in the on-going SLM activities under MAAIF

7.2 Dissemination of research output

A poster on the IP approach was developed. Three technical reports have been produced; (i) *Sustainable land management practices in the eastern highlands of Uganda: Implications for climate change adaptation* (ii) *Social networks for information flow and technology adoption among relevant stakeholders of land management in the eastern highlands of Uganda* and (iii) *Experience & Lessons in the Eastern Highlands and Central Rangeland of Uganda*. These reports are being developed further into manuscripts for publication in peer-reviewed journals. Two scientific seminars were attended in Mukono, Uganda and Kigali, Rwanda and papers based on the above technical reports were presented.

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