

Determinants of Participation in Contract Farming Among Small Holder Dairy Farmers in Rwanda

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Abstract: Milk production is one of the major income generating activities for smallholder dairy farmers in Rwanda but the sector is currently facing production and marketing challenges. Contract farming has been introduced as solution. However, low participation has hindered dairy farmers from getting optimum benefits accruing from contract farming not only low participation but the determinants of participation in contracting are still under research. The aim of this study was to analyze the determinants of participation in contract farming to the smallholder dairy farmers in Nyagatare District, Eastern Province of Rwanda. A multi stage sampling techniques were employed to select respondents. Structure questionnaires were employed to collect data from 211 .Probit model was used to determine factors influencing farmers 'participation, results from the probit model suggests that factors influencing farmers participation mainly include; uncertainty related to price, farm size, herd size of cross breeds, distance to milk collection centers, distance to water source, experience in dairy farming and trainings in forage management. The study concludes that in order to increase participation in contract farming, there is need for dairy policy to consider existing knowledge, assets of the farmers and decentralize milk Collection Centers.

Keywords: Contract farming, Probit.

1. INTRODUCTION

Contracting can act as an institution to overcome barriers of entry to agribusiness industry by smallholder farmers, but certain measures need to be undertaken to ensure contract enforcement and to reduce transaction costs (K Sartorius, Kirsten, & Masuku, 2003). While contract farming is widespread in Africa and many other developing countries, there are conflicting views on its impact on the welfare of smallholder farmers, some authors argue that contract farming is beneficial to the small holder farmers since it enables farmers to access ready markets and also to access global markets (Minot, 1986). On the other hand authors argue that contract farming is a means of exploiting farmers by the large agribusiness firms due to the unequal bargaining power (Singh, 2002). They criticize contract farming on the basis that most of the contractual terms are too costly for smallholder farmers to comply with and that most large firms break the contractual terms at the expense of the smallholder due to unequal market power. Some other critics of contract farming argue that contract farming is only beneficial for large scale farmers and that it only serves to push smallholder farmers out of the market and could even lead to rural inequality and entrench poverty among the rural smallholder farmers (Masakure & Henson, 2005).

The contradicting views make contract farming appear as a necessary evil in the production and marketing of certain agricultural commodities. It is necessary because it is often a solution to the problem of endemic market failures in developing countries. Yet, it is evil because it may be an avenue for some large agribusiness firms to exploit the small scale farmers.

Though, the concept of Contract farming has been introduced in Rwanda and viewed as efficient policy strategy to improve the performance of agricultural sector through creating a better marketing network, which will link farmers to markets. The question still remains for the factors influencing participation in contract farming.

Statement of the problem:

Diary sub sector in Rwanda is important sector due to its contribution 6% GDP, this is why the sector is being transformed into commercial orientated but dairy sector is currently facing production and marketing challenges (Mupenzi, Karenzi, Kanani, & Lussa Burasa, 2009). According to Eaton and Shepherd (2001b), the only solution to overcome these challenges, the concept of contract farming should be introduced this is why Inyange agribusiness company has introduced the concept with dairy farmers with objective of the promise of providing steady market, increased income accruing from an assured market, stability and fairness in prices, timely supply against timely demand and a strong relationship between the agro-processing industries and farmers, this is supported by Masakure and Henson (2005), who have stressed Africa, Asia, Central and Latin America to have variably benefited from contract farming through the access of production inputs, market outputs, market development, rural socio-economic development, and other intangible benefits arguing that contract farming can benefit both parties. However, the impact on contract farming is still under debate with ambiguities in accordance to Little (1994), criticizes contract farming suggesting that it aims to exploit non-wage household labor through dense networks of dependence and subordination and the research reveals that small holder farmers are exploited and highly controlled and is detrimental to the poor. Singh (2002) further criticize contract farming as a way large firms use to take advantage over the land of small holder farmers hence increasing poverty of small farmers through effectively paying them less than the minimum wage and taking control of their farms, Little (1994) in his studies found that incomes from contract farming increased for a moderate 30–40 percent to a high 50–60 percent proportion of participants and they further says that this income was not enough to live on, however, farmers had to rely on other farm and nonfarm income. Eaton and Shepherd (2001b), posits that contract farming has a negative effect on farmers' income because of a monopoly tendency and opportunistic behavior of firms, lack of transparent pricing and quality control is among the factors that result in a negative income effect.

This study closed this gap because the empirical knowledge and information generated provided evidence to policy makers on the results of the contract farming in practical conditions on farmers' live hood in Nyagatare district, provided image of contract farming in Nyagatare district. Thus, this will help in addressing the current dairy sector policy challenges, consequently boosting dairy sector in Rwanda.

Research objectives:

General objective of the study is to analyse the determinants influencing participation in contract farming among smallholder dairy farmers in Nyagatare district. Specifically the study has the following objectives.

1. To determine social economic factors influencing dairy farmers to participate in contract farming,
2. To investigate transaction cost factors influencing dairy farmers to participate in contract farming,
3. To identify institutional factors influencing participation in contract farming in Nyagatare district.

Research Hypotheses:

In this research two hypothesis were stated as follows:

Ho 1: Participation in contract farming is not influenced by social economic factors.

Ho 2: Participation in contract farming is not influenced by transaction cost factors.

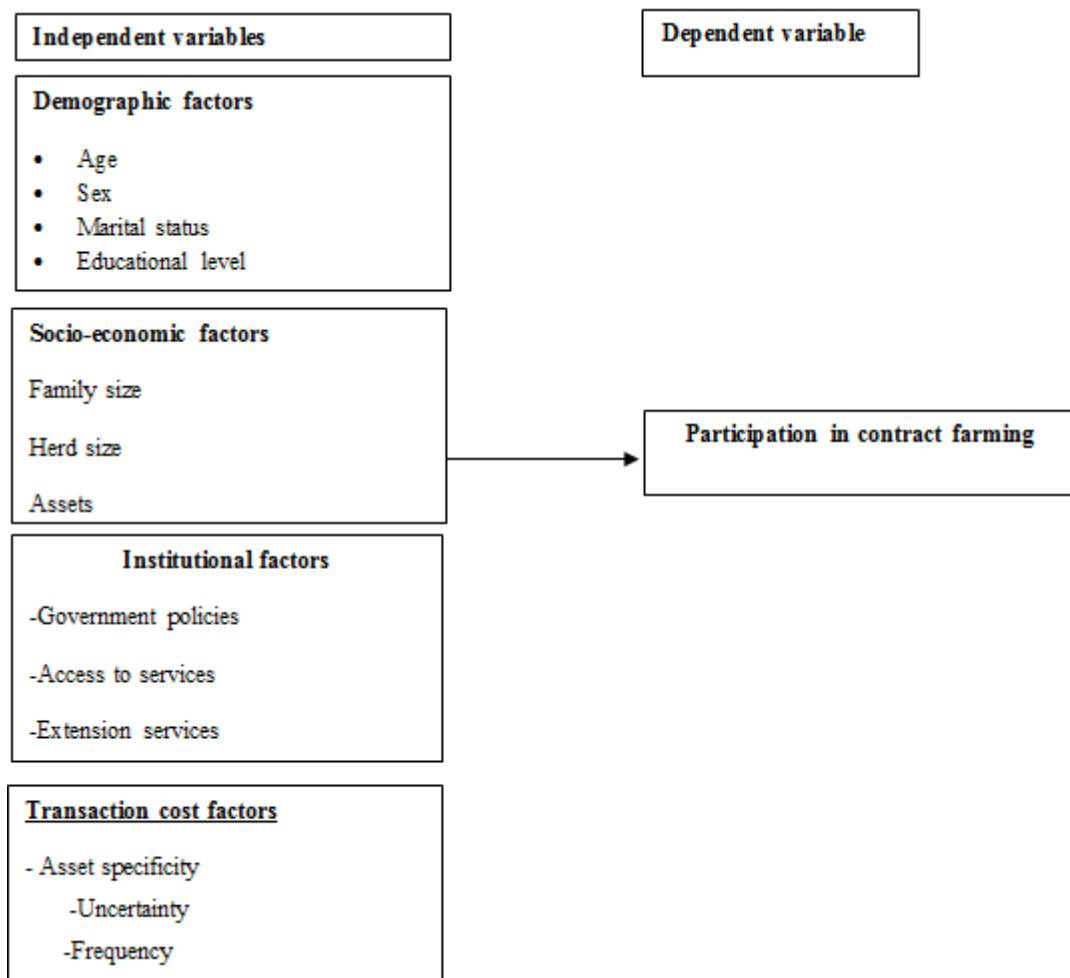
Ho 3: Participation in contract farming is not influenced by institutional factors.

Scope of the study:

This study was limited to determine factors influencing farmer’s participation in contract farming, effect of contract farming on farmer’s income, input use and effect on cattle and milk production in Nyagatare District. The study was limited to Rwimiyaga, and Nyagatare sectors and two contracted cooperative dairy farmers was chosen and non-contracted farmers neighbour them.

2. CONCEPTUAL FRAMEWORK

The study was conceptualized on a framework illustrating the relationship between independent variables and dependent variable. The independent variables were hypothesized to influence the decision of the farmer on whether to participate in contract farming or not and participation in contract farming.



Adopted from (Yirga, 2012)

3. METHODOLOGY

Theoretical model:

According to Sebopetji and Belete (2009), probit model constrains the estimated probabilities to be between 0 and 1 and relaxes the constraint that the effect of the independent variable is constant across different predicted values of the dependent variable. This is normally experienced with the Linear Probability Model (LPM). The probit model assumes that while we only observe the values of 0 and 1 for the variable Y, there is a latent, unobserved continuous variable that determines the value of Y. The other advantages of the probit model include believable error term distribution as well as realistic probabilities (Sebopetji & Belete, 2009). Thus, for this study the probit model is preferred and used. In this study only two options were available, namely “participant” or “non participant” a binary model was set up to define Y=1 for situation where the farmer participated and Y=0 for situations where the farmer did not participate.

The empirical model suggested for this study is a probit regression model depicting the relationship between the variables is as follows;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e.$$

Where

Y = Livestock production (LP)

X₁ = Social-economic factors (SEF)

X₂ = Transaction cost factors

X₃ = Insinstution factors

β₀ = Constant

β₁, β₂, β₃, = Regression coefficients to be estimated

ε = Stochastic term

Study area:

The District of Nyagatare is one of the seven districts of the Eastern Province. The District is divided into 14 Sectors made of 106 cells and 630 villages “Imidugudu”. The District spreads over an area of 1,919 km², with Uganda at its northern border, Tanzania at its East, Gatsibo District at the South and Gicumbi District on the Western border.

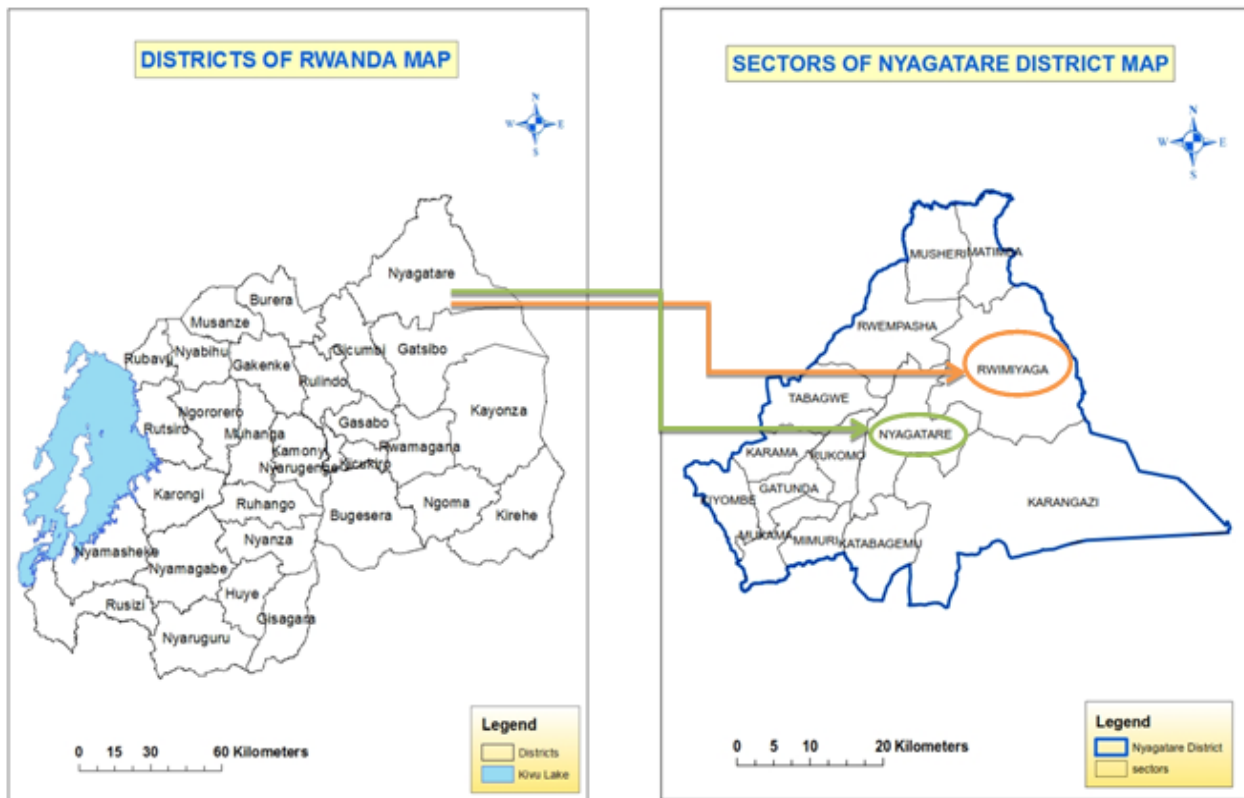


Figure 1: Map showing location of study area

Research design:

This study we used descriptive survey methodology using t test to test equality of means ,probit model was used determine factors affecting participation in contract farming in Nyagatare districtRwanda.Multistage sampling techniques was used to select respondents. The design employed self-administration of questionnaires to a sample of smallholder dairy farmers. The questionnaires was aimed at finding factors influencing participation in contract farming in Rwanda. The research used both primary and secondary data. Primary data inform of qualitative or quantitative were obtained using questionnaires while secondary data were gathered from documented published books and journals.

Target population:

This study targeted Nyagatare dairy farmers under contract in the selected sectors Rwimiyaga and Nyagatare sector who are dairy farmers and these farmers neighbour non contracted famers.

Sampling design:

A sampling frame is the list of population members (units) from which the sample will be drawn. It was contained a complete listing of every element in the target population that were got from sector veterinarians, and every element was included only once and this enabled the study to know the probability of elements being selected for a sample(Bowler, 2002)

Sampling method:

Three multi-stage sampling techniques were used to select respondents. In the first stage purposive sampling was used to select two sectors, out of fourteen sectors of Nyagatare district were selected on purpose based on the fact one was chosen Nyagatare for its level of development in dairy production and Rwimiyaga sector dairy sector is still under substance agriculture.

In the second stage, the total households in the four villages were stratified into two strata: contracted and non-contract farmers.

The non-contract farmers were selected within villages of farmers under contractual dairy production to ensure homogeneity of factors except contract farming. In the final stage, four villages (two from Nyagatare and two from Rwimiyaga) were selected randomly using simple random sampling in a total of 450 respondents (150 respondent under contract farming and 60 non- contract dairy farmers).The size of the two groups was determined based on the probability proportional to size principle.

Table 3.1. Representation of dairy farmers with and without contracts

Sectors	Villages	Total number of dairy farmers	Number of sample selected		Total sample
			Contracted	Non-contracted	
Nyagatare	Nyagatare	120	42	10	52
	Barija	94	30	12	42
Rwimiyaga	Bwera	86	28	8	36
	Kirebe	155	51	30	85
Total		445	151	60	445

Sample Size determination:

The sample size was determined based on groups of contracted farmers and non-contracted farmers in two sectors using a mathematical formula given by Miller and Brewer (2003) as

$$n = \frac{N}{1+N(\alpha)^2} \dots\dots\dots (1)$$

Where N=445 is the sample frame, n is the sample size and α is the margin of error.

α: precision level chosen (for confidence interval of 95%, equal to 5% significance level)

$$n = \frac{445}{1+445(\alpha)^2} = 211 \dots\dots\dots (2)$$

Data collection methods:

The study was based on primary data. Primary data was collected from contracted and non-contracted farmers using household survey questionnaire which primarily contained structured closed and open questions for milk production year 2015 to 2016. Quantitative data was collected from respondents.

The non-contracted farmers acted as control where as contracted farmers acted as treatment. The survey questionnaire was tested before the execution of main survey to ensure validity and reliability of the data.

Data Analysis:

Based on theoretical frame work the probit regression model was used to determine factors influencing participation in contract farming , the reason for the selection of the model was based on the fact thatprobit model was in respect to logit because a probit model ensures normal distribution of error terms. The dependent variable in this model is a binary variable indicating whether the household participated or not. The model was estimated with STATA version 13 computing software.

4. RESULTS AND DISCUSSION

Factors influencing participation in contract farming results from Probit:

The results of the study indicate that contract farming factors that influenced participation in contract farming was uncertainty related to price to participating farmers than their control counter parts because non contract farmers are more exposed to market dynamics than the contract farmers because milk prices change depending on prevailing market conditions.

In Rwandan context the results are as expected so participating in contract farming is one way to reduce uncertainty related to price, the results of the study are relevant to studies of (MWANGI, 2014),who found that contract farming reduces price uncertainty and marketing uncertainties.

The study findings in table 4.1, Illustrate that experience as indicator of uncertainty is significant to participation in contract farming at 95% confidence interval but as experience in farming increases participation in contract farming increases. In Rwandan context experience means ability and capacity to anticipate all contingencies related to production methods thus this can reduce supply if a farmer is less experienced there are high chances of failing, the results of the study, found that younger farmers with less experience were more likely to be in contract(Sáenz-Segura, 2006).

Results also illustrate that most of the factors that influenced farmers to participate in contract farming was that contracted farmers generally had bigger farm sizes which is not surprising in the study area but in, Rwandan case the result are not as expected since method of production is zero grazing but in study area the production system is free grazing and this type of production requires more land this means that irrespective farm size one cannot easily increase cattle production, studies found that contract firms prefer farmers with bigger farms and the reason is that contracting firm transaction cost is lower when working with bigger farms(Abebe, Bijman, Kemp, Omta, & Tsegaye, 2013).

The number of cattle specifically mixed breeds owned from results in table 4.1 influenced participation in contract farming and this explains variation in milk production capacity in Rwandan case the results are as not expected but in study area the results reflect reality meaning that large farm size correspondents to number of animals owned. The dominance of mixed breed in Rwanda can be explained by the fact that mixed breed requires lesser managerial capital and well adapted to harsh bio-physical environment and low quality feed compared to exotic breeds, the results of the study are supported by(Bayer, Alcock, & Gilles, 2004).

From a demand viewpoint, the positive effect of herd size in contract farming suggests that, by capitalizing on economies of size, cattle farmers are able to spread the cost of accessing information over the number of units produced, the findings of study relevant to what other scholars found that asset ownership, alternative income opportunities, demographic characteristics ,education and land size influenced participation in contract farming (Bolwig et al., 2009).

Expectedly, the distance to the milk collection center, an indicator of cost of access to benefit from contract farming influenced participation in contract farming cattle farmers living farther from the milk collection center are not more likely to participate in contract farming, one explain this by a consequence of having alternative and better local business places where dairy farmers can sell their produce and this affects participation and the quantity of milk supply to the milk collection centres. In Rwandan case and study area the results indicates limited capacity of the government to decentralize milk collection centers to diary farmers, the results of study are relevant of (Amare, 2013).

The results of the study revealed that access to trainings in forage management influenced participation in contract farming. However both contracted and non-contracted farmers had difficulties in accessing social services. In Rwandan case and study area, the results of the study can be explained by lack of enough of extension services to deliver these services. As the new institutional economics explain, service delivery is transaction cost-intensive, and the demand driven information is often more discretionary and specific (Birner & Anderson, 2007). Information asymmetry makes extension

workers unable to determine what individual farmers actually need, to deliver “standardized”, rather than specific information. Moreover, information asymmetry between field extension workers and dairy farmers in the study area creates a principal-agent problem, given that these field workers often cover vast rural areas. The results of their performance indicates serious gap to be covered. The hypothesis that social economic factors, transaction cost factors and institutional factors had no relationship with farmers’ participation status in contract farming rejected.

Table 4.1: Factors influencing participation in contract farming

Dairy cooperative)	Coef.	Std. Err.	Z	P>z
Sex	1.98	2.84	0.42	0.673
Age	0.04	0.03	1.48	0.139
Marital status	0.11	0.56	0.20	0.842
House hold size	0.07	0.07	1.04	0.301
Education	-0.09	0.06	-1.51	0.130
Experience	0.13	0.05	2.86	0.004**
Trainings in forage management	3.18	1.21	2.66	0.008**
Trainings in artificial insemination	-1.22	0.65	-1.88	0.060
Trainings in disease management	-0.16	0.69	-0.23	0.817
Trainings in farm records	-0.42	0.86	-0.48	0.628
Trainings in milking techniques	-0.21	0.77	-0.27	0.784
Trainings in milk quality and safety	-0.17	0.89	-0.13	0.897
Trainings in grades and standards	0.39	1.06	0.37	0.715
Trainings in water harvesting	0.25	1.14	0.22	0.826
Distance to road	0.01	0.00	1.47	0.143
Distance to Market	0.00	0.02	0.14	0.888
Distance to financial institution	0.01	0.01	1.03	0.304
Distance to milk collection center	-0.01	0.00	-2.46	0.014**
Distance to water source	0.02	0.00	2.00	0.045**
Price paid per litre	0.14	0.04	0.76	0.002**
Farm size	0.15	0.04	3.61	0.000**
Members trust	0.03	0.02	1.42	0.154
Leaders trust	0.02	0.02	1.25	0.211
Cross breeds	0.13	0.04	3.17	0.002**
Times milk sold per months	0.00	0.01	1.03	0.771
Cons	-5.55	3.48	-1.60	0.11

** Significant at 5 % percent level of significance

The results of the study indicated in table 3 only factors that influenced participation in contract farming. These factors are presented in their way in respect to statistical significance as follows was highly influenced by farm size at P-value (**0.0001****), uncertainty related to price and herd size of cross breeds at P-value (**0.002****), distance to milk collection centers at P-value (**0.014, 0.045****) and experience in dairy farming at P-value (**0.004****), trainings in forage management with p-value (**0.008****). These factors were statistically significant at **P < 0.05** level of significance.

5. CONCLUSION

Contract farming is efficient mechanism for marketing and production of agricultural products in value chain as it is expected in providing steady market, increased income accruing from an assured market, stability and fairness in prices, timely supply against timely demand and a strong relationship between the agro-processing industries and farmers, access of production inputs, market outputs, market development, rural socio-economic development, and other intangible benefits.

This is the first study done in Rwanda on effect of contract farming and based on the probit model approach, data from a survey of 210 farmers in two sectors, results from probit regression showed that transaction cost factors that influenced participation was Uncertainty and trainings in forage management , not only transaction factors but also social economic factors like farm size, cattle size, distance to water source influenced positively participation in contract farming however experience and distance to milk collection center decreased participation in contract farming.

6. RECOMMENDATIONS

The results of the study illustrated that contract farming reduces uncertainty related to price this can address the current challenges of demand and supply of milk production in the study area which is a big challenge in agriculture production and marketing in Rwanda. This can facilitate the dairy sector policy in the current strategies of increasing production.

The results of the study indicated that cattle and milk production has a positive relationship with being in the contract farming therefore exotic breeds should be introduced in the study area as they are more productive than mixed breeds this can increase income through increased milk production and the higher income can easily motivate cattle keepers to participate in contract farming. This can address the current challenges of low milk productivity and facilitate the dairy sector in the current strategic actions of dairy sector policy of improving dairy productivity.

The results of the study found distance to milk collection centers as be among the factors that reduced participation in contract farming thus the study recommends decentralization of milk collection centers and distance to water source as way to enhance participation in contract farming. This can facilitate dairy policy in the current strategic action of availing milk collection centers to neighboring villages such that after milking, milk reaches collection point in two hours as this can address the challenge of distance to reach the milk collection center.

The results of the study found that farm size and experienced influenced participation in contract farming thus this study recommends that the dairy policy should base on existing strengths of the farmers and strengthen the current strategies of extension education, visits, trainings and direct contact of extension workers with farmers increased as this can increase benefits of contract farming to beneficiaries hence participation in contract farming this can ensure the optimal realization of their livelihoods' potentials.

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