Sources of Risk in the Rice Production: A Case of Smallholder Farmers and Producers of Soba Community in Northern Nigeria

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ABSTRACT

Researchers have proposed different and varying methods in approaching risk factors and identification, but none has comprehensively dealt with the issue of risk factors in rice production. Most research on risk sources in rice production are treated on a broad level without narrowing it down to the farmers level. Risk identification in rice production should encompass all areas in the production as much as possible. In this study, based on how the factors, both outward and inward influences the productivity of rice production, the researchers aim at analysing the risk sources and perception in rice production in Soba, Kaduna state, Nigeria. Well established questionnaires were used in accumulating data from 342 farmers in the field. The sample number was derived using Yamane formula for determining the sample size in a population study. The information collected with questionnaires was examined making use of SPSS which entails the mean, frequency table, percentages, charts and Kendall's W-statistics. The results obtained from the research showed that the highest risk source to rice production in Soba included technological risks and also financial risks with a mean rank of 4.08 and 3.62, respectively. The estimation of the W-statistics turned out to be 0.413, which implies that there is a moderate agreement by rice producers, which is fairly acceptable. The estimated pertentage loss as a result of the identified risks is 33.645% from the farmers side and 20.513% from the processing side.

Keywords: *Risk assessment, risk factors, rice production, risk sources, science*

1.0   INTRODUCTION

As the Nigerian population increases, human needs have also increased. The agricultural sector is also affected because of its dependence on the elements of weather, climate, technology and human variables. The African continent including Nigeria is largely agrarian by nature. This leads to dependence on land for agricultural purpose [1]. According to Price Waterhouse Coopers (PWC), rice farming in Nigeria has proven to be much difficult to sustain in its production, not just to the nation as a whole but to the farmer himself [2]. In 2017, rice production in Nigeria was peaked at 3.7 million tons, while its consumption rate was estimated at 6.4 million tons [2]. From the report, Nigeria still needs to import about 2.7 million tons in other to meet up with its rising demand. Researchers have proposed different and varying methods in approaching risk factors and identification.

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Tychon *et al.* defined risk as a product of hazard and vulnerability [3]. This focus on rice production generates a need for a refined awareness of risk and its management practices, to ensure food security. To increase growth in the agricultural sector, the government have accelerated establishment of easy access to agricultural loans to aid farmers, as well as increase venture in irrigation systems to decrease reliance of rainfed agricultural systems in rice production. In association with foreign agricultural stakeholders, ensure that there is awareness to the local farmers about farming with Good Agricultural Practices (GAP) [4]. Despite all these determinations, the agricultural sector is classified with a firm vulnerability to risk such as: Price is likely to rise due to agronomic trade liberalization and production needs is expected to rise due to rising quality necessities for some products and firmer rules as regards the use of inputs [5]. Climate change also has an impact on production risk as well, among other things.

Rice production in Nigeria is confronted with several risks arising from financing, production, marketing, and inconsistent policies. It is necessary to understand the risk involved in rice production to ensure adequate management for food security in Nigeria. Unfortunately, agricultural production in Nigeria is integrally risky, which at the end puts farmers into excessive loss due to flooding in many parts of the country [6]. Additto *et al.,* , study the major sources of risk in the northern and eastern part of Thailand he identified unexpected variability of product prices as the major risk factor [7]. This factor is classified under market pricing risk. Nto *et al.* study risk management practices in rice production in Abia state of Southern Nigeria, and identify social risks and political risks as the two most important source of risks [5]. Research trend shows that that dominant sources of risk vary by location. However, none has comprehensively dealt with the issue of risk factors in rice production in Northern Nigeria. This paper aims to identify the sources of risk in rice production in Soba community and its influence on rice farmers and producers

2.0   LITERATURE REVIEW

2.1   Risk Sources in Rice Production

Risk sources comprise of all the factors and variability that produces a risk. In line with [8], there are five main roots of agricultural risk namely; production, marketing, financial, legal and social risks. Production risk is any occurrence or activity connected to manufacturing which comprises of various possible results. Marketing risks are market activities or occurrences that result in inconsistency of costs that farmers obtain in return for his or her products and services or purchase production inputs. Whereas financial risk covers all those risks that loom over the financial situation of a business. This contains the price and accessibility of capital, the flexibility to satisfy income needs in a very timely manner, it also contains the ability to keep up and grow equity and also, the ability to soak up short-term financial shocks [8].

Furthermore, Laurence *et al.* explained that the regular activities of most producer involve obligations that have legal implications [8]. Risk arising from these activities constitute a legal risk and having a good understanding of those risk and the way it affects producer businesses will result in better risk management decisions.

Finally, human risk arises from the point of view that individuals are inevitably the root of all business risks, also as an important part of the strategy in dealing with the risks. Human or social risk management is the ability to make sure that everyone who takes part in the business is kept safe, satisfied, happy and quite creative [8]. Based on literature review, there are different sources of risk in rice production, some of which embody the technology risk, political risk, economic risks, production risk, marketing risk, human or personal risk, and financial risk.

2.2   Macroeconomic Source and Policies Inconsistency

This could be referred to as 'political risk' and a few of its identifiers are when the government policies are not duly carried out like the increased price of foreign rice; not using the subsidized value to be given to producers; inflation of the price of inputs equipment by third parties. Inconsistency in plans makes forecasting unfeasible and difficult in rice production.

One of the key problems in rice production in the African nation is that most of the information for rice production is largely based on those that are being recirculated from the Agricultural Development Projects (ADPs) instead of a formal in-depth study. Therefore, a detailed report or illustration of the rice production system in nations across Africa is quite a difficult thing to come by. Also, the news out there at the ADPs rely on productions done quite at a large scale. Notwithstanding, there is a high number of low scale producers than large scale producers in Nigeria. The smallholder farmers are deserted on their own to make sure the sub-sector remains afloat against such a large amount of odds.

Many hindrances within the rice industry make up the industry's inadequacy to successfully attain sufficiency by itself in rice production. These problems must be addressed in other to cut back over-reliance in imports and to bridge the gap in terms of production and consumption. To ensure that the conditions necessary for meeting the production of rice is available, conscientious efforts by agricultural stakeholders, governmental focus and sound agricultural policies are very important.

The government inconsistent policies on the importation of rice, government officers ill-attitude towards farmers in the distribution/sale of fertilizers and other inputs have been found to be contradictory (including improved seed). Any intervention or investment designed around government policies might not be held for a long period as a result. The investors could succeed in influencing policies, however, the question is how long can the policies hold out before there is a need for change or it is neglected? [9].

2.3   Production Risk

Agricultural production suggests a presumed output or yield. Variability or changes in a number of the outcomes presents risks to the ability of the producer achieving its monetary goals. Production activities or event that feature various outcomes that could be attained is a production risk. The main risk sources of production are environmental condition changes, pests and diseases, technology, genetics, machine efficiency, and also the quality of inputs. Fire, wind, and theft together with other casualties are also risk sources in rice production [8].

Production risks also include unavailability of labour because of the unavailability of skilled workers within the production surroundings. Other parts of this risk are lack of improved varieties, obsolete, and inefficient technology; drought, flooding, poor soil fertility, decayed infrastructure, pest and diseases as well as land tenure [9, 10].

2.4   Marketing Risk

According to Laurence *et al*., marketing in agricultural production is the part of the agribusiness that transforms the activities of production into a financial success [8]. In agriculture, many unanticipated factors can affect the marketing price of agricultural products. Some of those factors may include weather or governmental actions, this can lead to dramatic changes price of input and outputs. A producer or marketer could take advantage of the variability in market prices by understanding and forecasting anticipated turn in events.

Marketing risk is any activity or occurrences related to market which steers us to differences in the prices farmers collect in exchange for their goods or pay for production inputs. Difficulty in accessing markets is also a marketing risk [8]. This risk is also related to high input cost and low output cost, which is due to incorrect care after harvest especially

in areas of polishing and packaging [11].

2.5   Social Risk
People managing risk may also be the one to have created it. Being able to make sure that everyone connected to the business remains safe, happy and creative is termed the management of human risk.

2.6   Financial Risk
Laurence *et al*. defines financial risk as the risks that loom over the financial status of a business [8]. There are four basic components; the cost and availability of capital, the capability to meet cash flow needs in time, the talent to maintain and grow equity, and the ability to take in short-term financial shocks. Cash flows are particularly necessary as a result of the various obligation still taking place like cash input prices and lease payments, tax payments, debt compensation, and family living expenses.

Nto *et al*. noted that interest rate and non-accessibility of credit to rice producers are part of the major reasons of financial risk in the production of rice [5]. Rice farmers usually loan cash from informal sources with a very high-interest rate. Formal credit establishments are extremely forced in funding rice production as a result of inherent risk and limitations related to the enterprise [12].

In a study conducted by Boggess *et al*. on the awareness of risk in crop production, rice manufacturers were asked to list out the impending risks and then to rate the risk sources depending on how important and drastic each risk was to their farms [11]. The results of the research carried out showed that many of the respondents listed out risk as the reason for a negative outcome. The respondents graded rainfall variability, pests and diseases, and changes in crop prices as the main source of risk for crop production [11].

Usman *et al*. studied the sources of risk and management strategies among farmers in rice post harvest management in Niger state [13]. The research showed that farmers in the study area were affected by the production risk, financial risk, human or personal risk, market or price risk and technological risk sources

2.7   Risk Perception in Agriculture
The evaluation of farmer's notions and also the way they respond to risks and approach risks are important because this could explain the attitude of rice manufacturers towards making decisions when they come across risky situations [14]. The low amount of vital information on the views of farmers' towards risk and their attitude when they come face to face with risk present a tough work for policymakers and researchers who would like to see and take part in improving the risk management system to help farmers [14]. Existing studies show that there is no agreement concerning what the right and best methods to explain the sources of risk and response of farmers to risks on their farms. However, the *Likert*-scale rating technique has been often applied in previous research. In most of these studies, the respondents were asked to rank the sources of that plagued their farm and also collectively, the ways they managed the risks on a scale of 5 points (where a measurement of 1 is not really important and 5 is extremely important) [7].

3.0   METHODOLOGY

The sample size is calculated using the *Yamane* formula of determining the population study. Based on the information obtained from the Kaduna Agricultural Development Agency (KADP), there are about 3000 rice farmers in Soba Local Government of Kaduna state and about 100 local rice millers.

Yamane formulation was used for determining the population size:

$$Yamane \text{ formula} = N \div (1 + Ne^2) \qquad (1)$$

where N is population size, and e is alpha level (0.05 for 95% accuracy). If $N = 3100$, the sample size from the population size is 354 respondents. A total of 342 respondents will be the paddy farmers while 12 respondents will be the rice producers.

The main source of data was obtained through questionnaire (structured questions administered on the field). Their knowledge and expertise were used as criteria for recruiting data collectors ensured accuracy in data collection. The data collectors were also trained on the researcher's need to avoid conflict of ideas and avoid misinterpreting the questions. The questionnaire includes sections for rating the following risks using a *Likert* scale: technology risk, political risk, economic risk, production risk, marketing risk, human or personal risk, and financial risk. A pre-test of the structured interview to fill the questionnaire was carried out to avoid repeating questions.

4.0 RESULTS AND DISCUSSIONS

This section discusses the results of analyzed data gathered from the field. Table 1 shows the risk sources in rice production in Soba, Kaduna State, Nigeria. based on the table, producers ranked the technology risk as to the highest source of risk they are exposed to, followed by the financial risk.

Findings reveal that the farmers have low access to modern agricultural implements and machines to sustain their production processes. Also, the findings reveals that the financial risks pose a significant risk source as most of the farmers are poor; this results in low management of resources in their production process and ultimately leads to low output.

Based on the researcher's interview, most of the rice producers are poor and do not have the means to secure advance equipment to assist their production process. Equipment such as tractor could come in handy in the areas of preparing the land for rice production. apart from easing the farmers work, It is also more effective and efficient than the manual or biological process. Also, farmers in this region lack knowledge of good agricultural practice and fail to adopt new technology methods that will further boost their production.

Table 1: Risk sources

Risk Sources	Mean	Std. Deviation	Degree of Occurrence
Production risk	2.7159	0.8906	Moderate
Market pricing risk	3.3458	0.8481	Moderate
Political risk	3.2713	0.9772	Moderate
Social risk	2.8658	0.8475	Moderate
Financial risk	3.6193	0.9563	High
Technology risk	4.0799	0.5376	High
Agricultural risk	2.9060	0.8891	Moderate

Source: Researcher Data, 2018

Financial risk which is also a big problem posed by the farmer can severely reduce or put a stop in an agricultural production process. In the areas of securing agricultural inputs and hiring labourers, producers can do only little with lack of adequate funds.

Production risks are the least risky based on the mean. This is probably because farmers are adept in rice production since it's their major source of income and livelihood. Moreover, based on the researcher's interview, it shows that they have been farming for years. The production processes are within their environment, so it is properly monitored and controlled. A summary of the sources of risk in rice processors is tabulated in Table 2.

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Table 2: Summary of sources of risk in rice processors

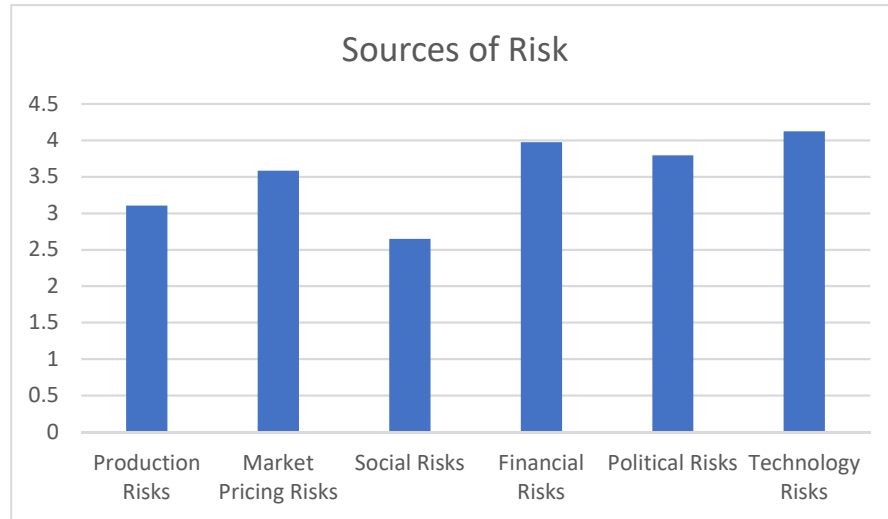| Sources of Risks	Mean	Std. Deviation
Production risk	3.1041	0.41559
Market pricing risk	3.5833	0.46210
Social risk	2.64582	0.84439
Financial risk	3.9722	0.71778
Political risk	3.7917	0.58816
Technology risk	4.1250	0.39895

Source: Researcher Data 2018

Figure 1: Sources of risks in rice production

4.1   Analysis of Percentage Loss in Rice Production

Table 3 shows the estimated paddy yielded after harvest in the farmer's last production. The results show the mean of the actual paddy yielded by the farmers, and the expected paddy yields as 33.79 bags and 50.92 bags, respectively. The estimated percentage loss after rice farming from the farmer's side is presented in the table.

Table 3: Estimated percentage loss after rice farming.

Total Yield after Harvest in the Last Production (in bags)	N	Minimum	Maximum	Mean	Std. Deviation
Expected	342	7.00	150.00	50.9181	21.40242
Actual	342	3.00	130.00	33.7865	15.13453
Valid *N* (listwise)	342				

Meanwhile, Table 4 shows the estimated produced rice after processing in the producer's last production. The expected rice has a mean of 9.75 bags while the actual rice produce has a mean of 7.75 bags.

Table 4: Estimated percentage loss after rice processing

Total Rice Yield after Processing in the Last Production (in bags)	N	Minimum	Maximum	Mean	Std. Deviation
Actual	12	5.00	10.00	7.7500	1.71226
Expected	12	6.00	13.00	9.7500	2.09436

Valid *N* (listwise)	12

The calculation for estimated percentage loss after paddy harvest:

$$\% \text{ Loss} = \frac{M2 - M1}{M2} \times 100\% \tag{2}$$

where

M2	:	mean expected output
M1	:	mean actual output

% Loss of paddy after harvest = 33.645%
% Loss after rice processing = 20.513%

The results show that about 33.645% of paddy were lost during the production, while the rice producers had a percentage loss of 20.513%. This estimated loss could be attributed to the risk that occurred during the production. From the previous result, it was found out that technology risk and financial risk were the dominant sources of risk in the farmers and producers production. A large portion of these losses in rice production can be attributed to poor farming practices which arise from lack of adequate finance and failing to adopt modern agricultural practices.

4.2. Concordance of Rice Producers Judgement

Kendall's W-statistics is an econometric tool used to ascertain the level of concordance of respondents on a particular subject. The degree of ranking is between 0 and 1, with 0 showing no agreement and 1 showing a high level of agreement. A more detailed interpretation of *W*-statistic shows that $W \leq 3$ means weak agreement, $0.3 < W \leq 0.5$ means moderate agreement, $0.5 < W \leq 0.7$ means good agreement, $W > 0.7$ shows strong agreement [15]. Table 5 shows the concordance of the rice producers' judgements using *W*-statistics.

Table 5: *Kendall*'s coefficient of concordance of rice farmers

Test	Results
N	342
Kendall's W	0.413
Chi-*s*quare	847.072
Degree of freedom (*Df*)	6
Asymp. Sig.	0.000

According to the table, the coefficient of concordance was calculated to be 0.413. Since the *W*-statistics falls between 0.3 and 0.5, the result shows that there is a moderate agreement between the respondent which is fairly acceptable. Based on the result, it can be asserted that the concordance of rice producer's judgement is non-random. In accordance with this, the mean rank of risk sources is shown in Table 6.

Table 6: *Kendall's* coefficient of concordance of local rice processors

Test	Results
N	12
Kendall's W	0.769
Chi-square	46.146
Df	5
Asymp. Sig.	0.000

The table shows the concordance of the local rice producers in rice production in Soba local government of Kaduna state. From the table, the coefficient of concordance was calculated to be 0.769, indicating a strong level of agreement amongst local rice processors. Also, based on the result, it can be asserted that the concordance of rice producers judgement is also non-random. In accordance with this, the mean rank of risk sources is shown in Tables 7 and 8 for rice farmers and local rice processors, respectively.

Table 7: Mean rank of risk sources by rice farmers

Risk Sources	Mean Rank	Order of Mean Rank
Technology risk	6.62	7th
Financial risk	4.80	6th
Market pricing risk	4.14	5th
Political risk	3.80	4th
Social risk	3.06	3th
Other agricultural risk	2.94	2nd
Production risk	2.63	1st

According to Table 7, the first two most significant risk factors are technology and financial risks with mean ranks of 6.62 and 4.80, respectively.

Table 8: Mean rank of risk sources by local rice processors

Risk Sources	Mean Rank	Order of Mean Rank
Technology risk	5.25	1st
Financial risk	4.92	2nd
Political risk	4.00	3rd
Market pricing risk	3.75	4th
Social risk	1.75	5th
Production risk	1.33	6th

From Table 8, there is a strong similarity in farmers and processors risk assessment in rice production. The result indicates that technology and finance is a dominant risk affecting rice production, in terms of farming and processing. This signifies that the two factors (technology and credit) play an important role in the rice agribusiness. This problem faced by farmers and producers can not be handled alone but may also need government supports in the areas of loans, agricultural inputs subsidy and incentives to help boost the rice production in Soba local government.The risk sources in decreasing order was presented in Figure 2 for the farmers and Figure 3 for the producers in a clear-cut view of the sources of risk.
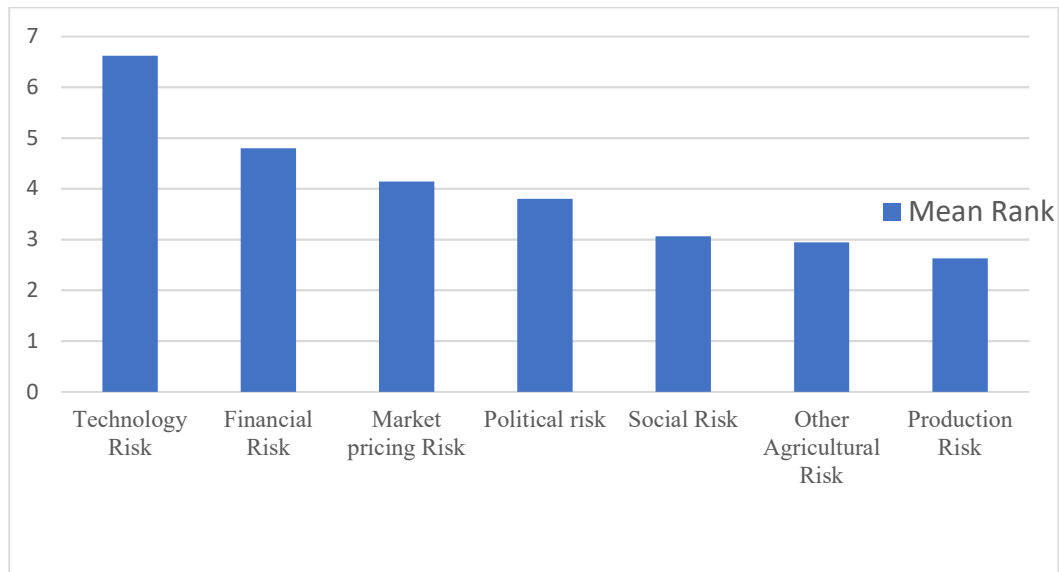
Figure 2: Risk sources by rice farmers in decreasing order
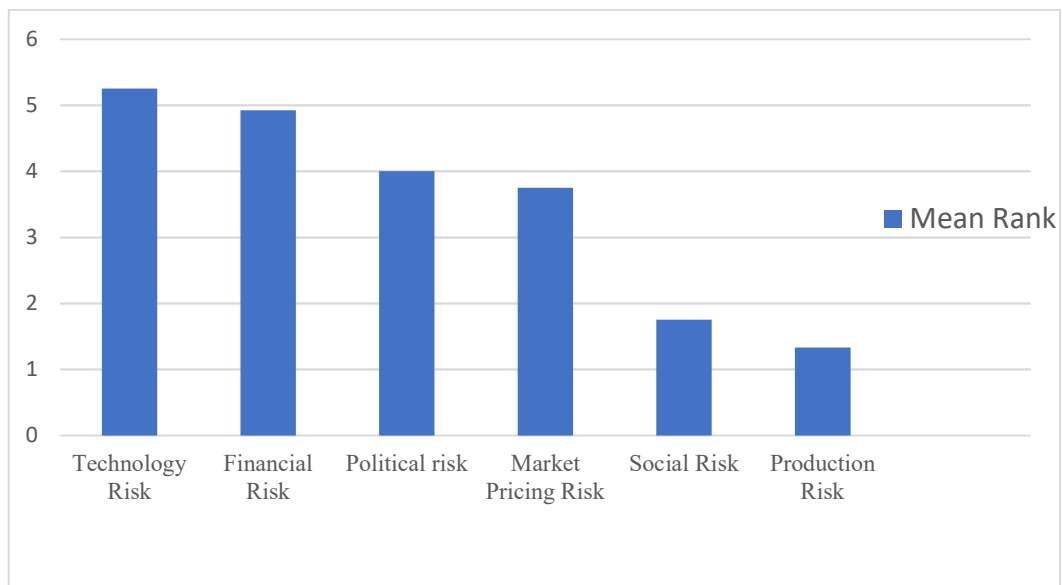

Figure 3: Risk sources by local rice processors in decreasing order

This study is not in line with Nto *et al*. (2014) who conducted the study on the evaluation of risk management practices in rice production in Abia state [5]. In his study, the two most significant source of risks were social and political risks. This is an indication that the dominant sources of risk vary by location although the study is in strong conformity with that of Additto [7].

5.0   CONCLUSION

The research was carried out to identify the sources of risk in rice production in Soba, Kaduna State of the Federal Republic of Nigeria. The respondent was drafted out randomly from a sample size of the population. Data were collected from the main sources of 354 rice producers and was analyzed using mean, frequency tables, percentages, and *Kendall* statistics. Findings reveal that the main sources of risks affecting rice production in Soba are technology and financial risks. This indicates that the producers lack the required funds

and equipment's to properly sustain their production. Other minor but important sources of risk constitute the major problems in rice production in Soba local government of Kaduna state are political, production, market pricing, social and other agricultural risks. The estimated pertentage loss as a result of the identified risks is 33.645% from the farmers side and 20.513% from the processing side. The future fertile research ground include identification of effective means of risk mitigation efforts in rice production.

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