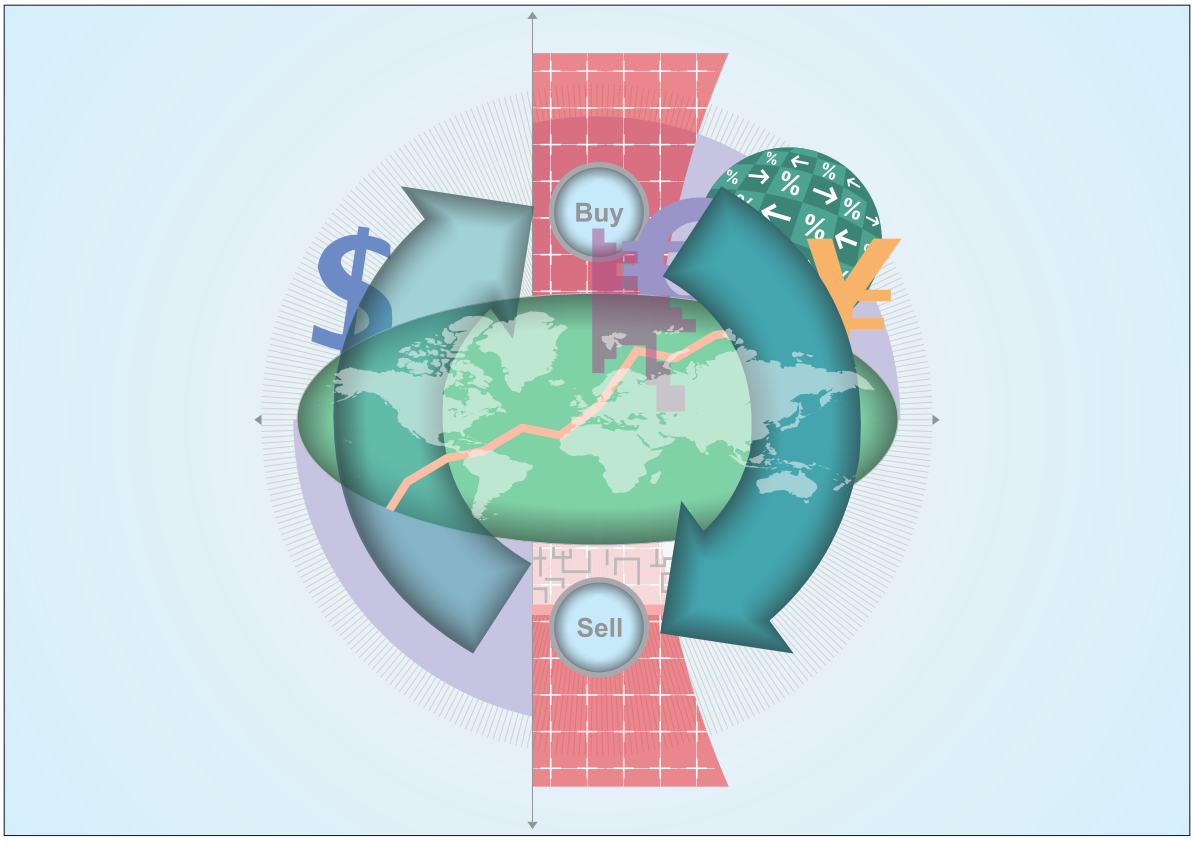

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Production Expansion, Competitiveness and Comparative Advantage of Upland Rice Production: Case of Fogera and Libokemekem Plain in Ethiopia

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ABSTRACT

Assessing the comparative advantage in upland rice production is of a major academic interest as well as policy significance because upland rice production competes for key production inputs land, labour and water which could have been used in alternative production activities. The introduction of rice in the Ethiopia were in early 1970s and early 1980s and production of upland rice under shifting cultivation system is an important economic activity in the Fogera and Libokemekem plain of northern western Ethiopia. The demand for rice combined with increasing land pressure in the lowlands, upland rice varieties is expanding very fast and the production competes for key production inputs land, labour and water which could have been used in alternative production activities. The gross income of paddy production was 16153 ETB per hectare and the cost benefit production of paddy per hectare shows that production of paddy was profitable. The Policy Analysis Matrix (PAM) methodology was used to determine the level of economic competitiveness in the production of upland rice crops in the Fogera and Libokemekem plain. The results indicate there is negative divergence between private and social profits indicating an expansion of the production of upland rice was profitable at farm level but not competitive at country level. This was because net effect of policy intervention is to reduce the farm level profitability of upland rice in area. The results show up the need for removing existing policy distortions in the structure of economic incentives to enhance economic efficiency and to attain coutry level competitiveness in upland rice production.

Key words: Comparative advantage, competitiveness, policy analysis matrix, profit analysis

INTRODUCTION

Rice is a staple food crop for more than half of the world's population. The Asian rice, *Oryza sativa* and African rice *O. glaberrima* are the two most cultivated species. In many countries in Sub-Saharan Africa (SSA), the consumption of rice has been increasing far more rapidly than domestic rice production due to rapid population growth and urbanization in the region (ARC (WARDA), 2008). When the price of rice surged in 2007 and 2008, food insecurity among the poor became more serious (Ivanic and Martin, 2008; Benson *et al*., 2008). Since rice is a major cereal crop that can improve food productivity in SSA, policies to enhance rice production are urgently needed not only for food security but also for income generation (Larson *et al*., 2010). Ethiopia is one of the few countries in SSA in which domestic rice production has been increasing recently. The discovery of wild rice in the Ethiopia were in early 1970s and early 1980s through the technical support of North Korean experts, rice cultivation in the seasonally flooded plains

started as a pilot in Jigna and Shaga cooperatives in Fogera plain. Following, Getachew Afework effort who was initially an expert in South Gondar Department of Agriculture started to collect seed locally from the previous introductions. Initial seeds were therefore obtained from a farmer in Jigna kebele and that was why it was named as X-Jigna. After multiplication, seed was again distributed to other farmers for demonstration and research purposes under his supervision, Adet Agricultural Research Center have released rice varieties such as Gumara, Kokit and Tigabe. The potential rice production area in Ethiopia is estimated to be about 20 million ha. By 2004, through various development activities, the rice production area had increased to about 6000 ha. The number of farmers engaged in rice production has increased from about 53 thousand in 2006 to about 260 thousand in 2008.

In recognition to its importance, the Government of Ethiopia has developed national strategy for rice research and development to guide the integrated and focused promotion of the rice sector in the effort to ensure food security in the country (MoARD, 2010). Consumption of imported rice has recently increased tremendously which boosted rice cultivation locally. The increased demand for rice in the local market is creating conducive environment for farmers and investors to produce more rice; which again led to acquisition and development of additional rice farms in different parts of the country. During the intervention period, the price of rice tripled which further stimulated the interest in rice production. In the 1990s, rice extension service was one of the major focus areas, all attention was given to the lowland rice and increasing demand for rice combined with increasing land pressure in the lowlands led to the development of upland rice varieties. As a result, in 2010, the rice area had increased to around 15,500 ha, of which over 5000 ha was in the uplands. The total production of upland varieties since its introduction was estimated at 5924 quintal in an area of about 212 ha. This results in average yield of 27 quintal ha^{-1} which was low as compared to the average yield data which was based on the X-Jigna variety. Project efforts concentrated on the testing/introduction of upland varieties New Rice for Africa (NERICA) and its seed system to complement the already existing X-Jigna variety, commonly used in Fogera and Libokemekem. The plain is 899.44% suitable for rice (Assegid, 2007). Previous studies on upland rice production show that introduction of the NERICA variety has increased the upland rice cultivation area.

Even though upland rice is introduced nearly, it is expanding very fast upland rice production competes for key production inputs land, labour and water which could have been used in alternative production activities. Hence, it is high time to assess production expansion and its comparative advantage compared to the being replaced crops according to farmers perspective and with imported rice. Due to distortions in factors and output markets, externalities and government policy interventions, social or economic profitability deviates from private profitability. This allows a wide gap between competitiveness and comparative advantage and failure to measure and account for market distortions might lead to biases. Comparative advantage indicates whether it is economically advantageous for a country to expand production and trade of a specific commodity, while competitiveness indicates private commercial performance of individual firms (Warr, 1994). This study aims to evaluate to basic information on production expansion trend of upland rice in major rice growing areas, to compare comparative advantage of upland rice with other complimentary crops of the farming system and to analyze the profitability of upland rice production in Ethiopia.

METHODOLOGY

Study area: The study area is located in north western Ethiopia and it is situated at 11°46-11°59 latitude North and 37°33-37°52 longitude East. Altitude ranges from 1774 to 2410 m above

sea level and is predominantly classified as mid agro-ecology. Based on the existing digital data, mean annual rainfall was 1216 mm ranging from 1103-1336 mm from both the short (March and April) and long rains (June to September). Farmers depend on long rainy season for crop production. They gets much of the flood water that accumulates around Lake Tana and the two big rivers, i.e., Rib and Gumara rivers (Fig. 1).

Method of selection of respondents: A multi-stage sampling technique was employed in the study. Firstly, 4 kebeles were selected from each of the two districts. Secondly, 3 communities were randomly selected from each of these kebeles. Finally, 14 households were chosen from each of 12 communities. In all, a total number of 168 households were used for the study.

Methods of data collection: The data for this study were collected from both primary and secondary sources. Primary data were collected from samples of the respondents through a questionnaire survey. Secondary data like population number, agricultural inputs and output prices were collected from different sources. Secondary data sources were woreda office of agriculture, CSA, cooperative offices, office of trade and industry about fertilizer cost, seed cost, agricultural products price.

Method of data analysis

Profitability analysis: Gross profit analysis were applied as stated as follows:

$$\text{Gross profit} = V - C = PQ - \sum_{i}^{n} p_i q_i$$

where, P is price of the produce, V is value of production, Q is total production per hectare, q_i is quantity of input i, p_i is price of input I and C is total cost of production.

Profit analysis does not consider the economic costs and benefits and it measures simply the accountants cost and profits and market price is used for price measurement.

Policy Analysis Matrix (PAM): The Policy Analysis Matrix (PAM) methodology was used to determine the competitiveness and comparative advantage in the production of upland rice crops in the study area. PAM is a tool that allows us to examine the impact of policy by constructing two enterprise budgets, one valued at market prices and the other valued at social prices (Table 1).

Table 1: Framework of Policy Analysis Matrix (PAM)

		Costs		
Rice production	Revenue	Tradable inputs	Domestic factors	Profits
Valued at private prices	$A = P_{id}*Q_i$	$B = P_{jd}*Q_j$	$C = P_{nd}*Q_n$	D
Valued at social prices	$E = P_{ib}*Q_i$	$F = P_{jb}*Q_j$	$G = P_{ns}*Q_n$	H
Divergence	I	J	K	L

P_{id}: Domestic price of output i, P_{jd}: Domestic price of tradable input j, P_{ib}: International price of output i, P_{jb}: International price of tradable input j, P_{nd}: Market price of non-tradable input n, P_{ns}: Shadow price of non-tradable input n, Q_i: Quantity of output, Q_j: Quantity of tradable input, Q_n: Quantity of non-tradable input, Private profit: D = A-(B+C), Social profit: H = E- F+G), Output transfer: I = A-E, Input transfer: J = B- F, Factor transfer: K = C-G, Net policy transfer: L = D-H

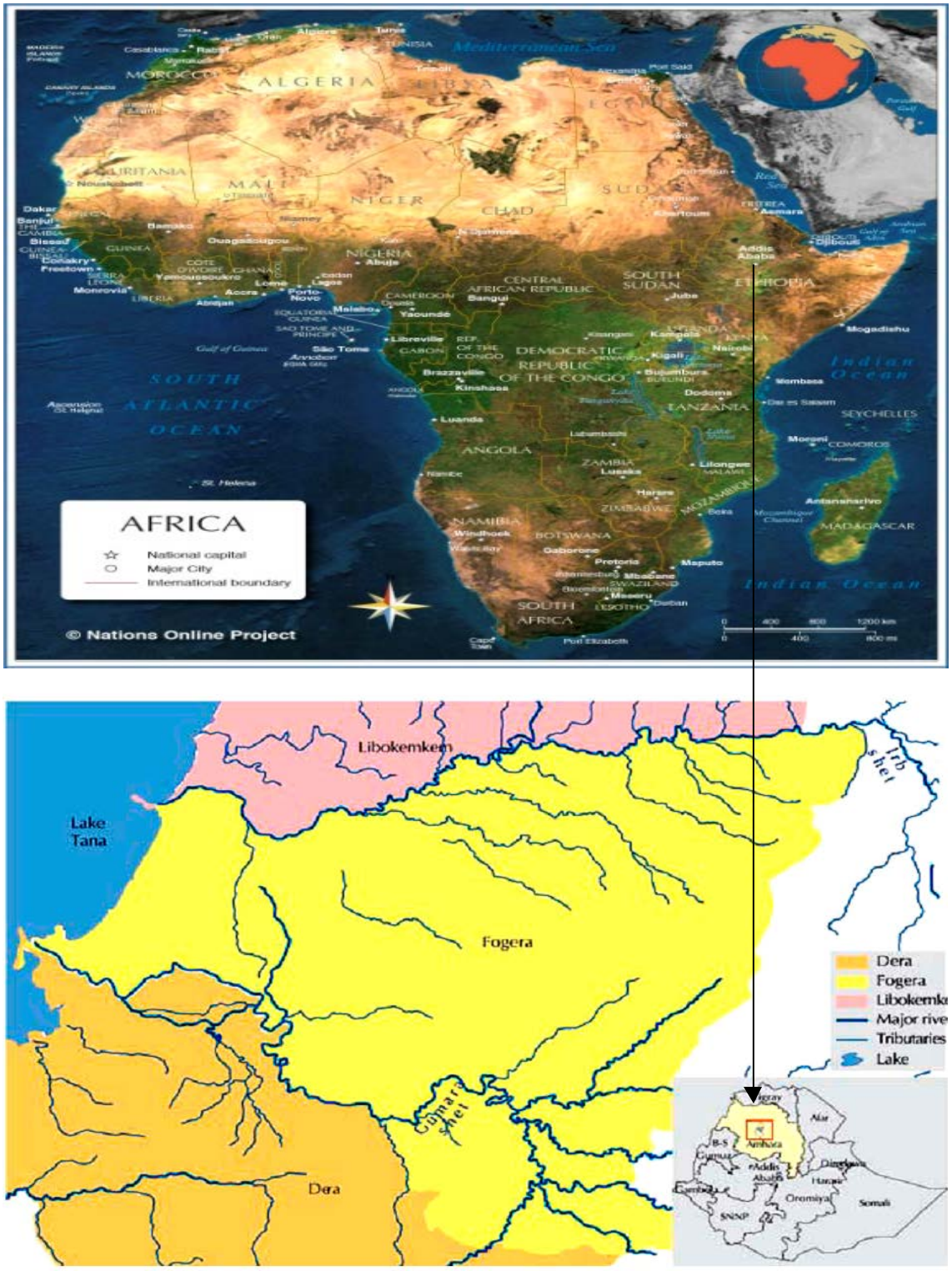

Fig. 1: Location of Fogera and Libokemekem plain

RESULT AND DISCUSSION

Household characteristics: Household is the primary unit of analysis. From the collected sample data, household. characteristics, namely sex, age, family size, labor power and education level were believed to influence decision-making. A random selection of 120 farmers from the two farming systems encompassing 9 female and 111 male farmers were taken. These were assessed and the result was obtained (Table 2).

Land allocation: The respondents' farm size ranged from 0-2.5 ha with a median land size of 1.5 ha. In terms of allocation, the largest land allocated was to rice 2.06 ha, grass pea 2 ha, wheat 1.25 ha, millet 0.75 ha and teff 0.43 ha put in order (Fig. 2).

Crop relative to the level of cash generation: The sale of crops is by far the largest source of income across the board and there is no other livelihood zone in area where even the very poor get upwards of 70% of their cash from selling their own produce. The main crop sold is rice, complemented by maize, pulses, teff, chick peas and millet (Table 3, 4).

Profit analysis of rice production: Upland rice producers generate income from sales of paddy alone or sales of polished (milled) rice. Rice producers generate income from sales of paddy alone or sales of polished (milled) rice. It has two by-products. These are straw yield and husk yield. Straw yield used for construction of house and husk yield (cover rice) also used for cattle feeding and fattening purpose for farmers. Husk yield is also used for making chip wood. Usually farmers do not use the husk yield. It will be left for millers during milling of their paddy. In this study, straw yield is also considered to calculate the gross income of farmers. The mean paddy rice

Table 2: Household characteristics of upland rice producers

Parameters	Minimum	Maximum	Mean	SD
Age of the household head	21	73	43.93	12.538
Education levels of the household head	1	4	2.25	1.008
Total family size	2	9	5.76	1.868
Annual income from the farming	7000	250000	31900.33	34702.57
Annual income from the non-farming	0	12000	1084.72	2882.402
Total land holding	0.00	10.00	4.8421	2.03668

Computations from field survey, 2013

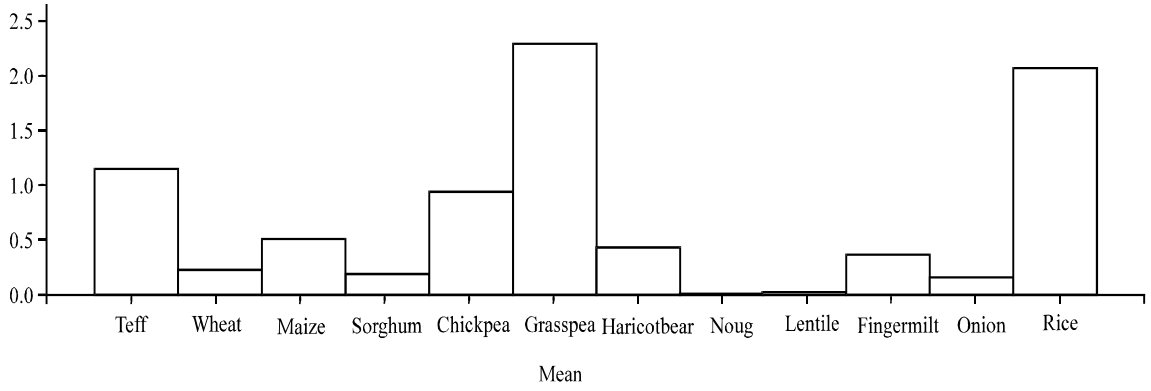

Fig. 2: Mean land allocation to competent and substitute crop in the study area

Table 3: Crop relative to the level of cash generation

	Primary crop		Secondary crop		Tertiary crop	
Crops	Frequency	Percent	Frequency	Percent	Frequency	Percent
Rice	63	82.9	5	6.6	6	7.9
Grass pea	7	9.2	52	68.4	9	11.8
Chick pea	2	2.6	11	14.5	34	44.7
Haricot bean	2	2.6	2	2.6	4	5.3
Teff					6	7.9
Onion	1	1.3	2	2.6	2	2.6
Finger millet			3	3.9	3	3.9
Tomato	1	1.3	1	1.3	2	2.6
Total	76	100.0	76	100.0	76	100.0

Computations from field survey, 2013

Table 4: Substitute and complementary crops in the study area

	First substitute		Second substitute			Complimentary	
Crops	Frequency	Percent	Frequency	Percent	Crops	Frequency	Percent
Teff	47	61.8	17	22.4	Grass pea	58	76.3
Finger millet	23	30.3	24	31.6	Chick pea	17	22.4
Haricot bean	5	6.6	7	9.2			
Maize	4	5.2	7	9.2			
Sorghum			1	1.3			
Total	76	100.0	76	100.0		76	100.0

Computations from field survey, 2013

Table 5: Profitability analysis of upland rice production

Parameter	Minimum	Maximum	Mean	SD
Paddy yield (qt ha^{-1})	3.00	25.00	9.6508	4.0725
Price of paddy (birr qt^{-1})	470	589.4	529.70	4618.57
Straw yield (shekim ha^{-1})	50	3000	918.49	517.43
Price of straw (birr $shekim^{-1}$)	12.316	15.21	13.763	5.46
Total revenue	1410	14735	5111.61	
Opportunity cost of land (birr ha^{-1})	300	3000	1200.9	516.162
Total labor cost	510.00	3900.00	1611.905	791.34656
Total input cost	120	1172	559.08	233.855
Interest rate			1004.65	759.60
Total cost	1801	7703	4370.90	1182.269
Net profit (loss)	-132	13245	4038.16	2790.419

Computations from field survey, 2013

production was 38.6 qt ha^{-1} with a standard deviation of 4.0725. The gross income of paddy production was 16152.64 ETB ha^{-1} and the standard deviation was 2790.419. The cost benefit production of paddy ha^{-1} shows that production of paddy was profitable (Table 5) compared to the competent crop (Table 6).

Policy analysis matrix: The completed Policy Analysis Matrix is shown the effects of policies on the relative competitiveness of upland rice. A negative divergence between private and social profit implies that the net effect of policy intervention is to reduce profitability of upland rice production

Table 6: Profitability analysis of first competent crop

Item	Minimum	Maximum	Mean	SD
Competent crop grain yield	0.5	15.0	3.940	3.2310
Value of competent crop grain	600	9600	3189.18	2270.622
Value of straw yield	50	3000	918.49	517.439
Total revenue	1000	10600	4107.67	2291.982
Opportunity cost (land rent)	300	3000	1200.68	516.162
Total labor cost	180	2680	871.58	544.355
Total input cost	60	988	344.10	220.359
Total cost	1240	5798	3096.38	1043.310
Net profit (loss)	-2365	6290	1025.01	2119.821

Computations from field survey, 2013

Table 7: Results of policy analysis matrix for upland rice production

		Costs		
Rice production	Revenue	Tradable inputs	Domestic factors	Profits
Valued at private prices	16153	2735	5236	-651
Valued at social prices	23061	2921	6266	5041
Divergence	-6908	-185	-1031	-5693

Computations from secondary sources, 2013

and a removal of policy distortions would substantially increase profitability. upland rice farmers receive lower revenue than they would have done in the absence of policy distortions. With a minor adjustment in the nominal rates of protection it can be produced with positive private returns and the upland rice production system would become competitive. Profitability coefficient measures the incentive of all policies and services as an estimation of the net policy transfer (Monke and Pearson, 1989). The Table 7 indicates that existing policy intervention is not served as incentive to rice production in upland ecologies.

CONCLUSION

A mixed picture arises from analyzing the competitiveness and profitability in the upland rice sector. The gross income of paddy production was 16153 ETB ha^{-1} and the standard deviation was 2790.419. The cost benefit production of paddy per timade shows that production of paddy was profitable. The upland rice production system was economically efficient and maintained a comparative advantage, but the prevailing price structure discriminates against growing this crop as shown by negative private profitability showing a lack of competitiveness at the farm level. The upland rice ecologies under analysis achieve negative divergence and private prices meaning that the unit cost of domestic resources engaged in producing a unit of the final output is more than the value added generated by this unit. It also expresses the need for the removal of policy distortions to increase the incentives for growers to expand production upland rice.

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