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Measurement of post-flight food waste: A case of South African Airways

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Abstract

The United Nations 2030 Agenda for Sustainable Development promulgated 17 Sustainable Development Goals in September 2015. The overarching aim of these goals was to promote a socio-economically and environmentally sound development agenda across all countries worldwide in order to curb global social, economic and environmental issues that manifest themselves in widespread poverty, starvation, ill-health, inequality, inequitable resource distribution, pollution, climate change and many other indicators. This study was aimed at determining the contribution that the airline catering industry could make towards the attainment of some of the 169 2030 targets of the UN particularly those that speak to starvation, food waste and environmental destruction. The methodology was quantitative using data collection sheets in order to quantify the amount of food that returned from all economy class flights over a period of 4 days at the Johannesburg kitchen of Air Chefs South Africa. The design was a cross-sectional case study as data was collected at a specific point in time using one airline only. The study exposed that there were a lot of different categories of food that returned untouched but was regarded as spoilt and unfit for human consumption and this was not donated to charity organisations for fear of liability in case of food poisoning events.

Keywords: sustainable development, food waste, airline catering, South Africa.

Introduction

The airline catering industry is responsible for mass production and waste of various assortments of food stuffs (Springer, 2017). Lindgreen and Hingley (2009) acknowledged that while the hospitality and tourism industry has created a lot of jobs it also accounts for big amounts of food waste. As the number of air travelers was projected to grow exponentially to 7 billion passengers per year by 2034 (Romli, Rahman & Ishak, 2016), 7.2 billion by 2035 (Rosen, 2017), and 7.8 billion per year by 2036 (IATA, 2017), airline food production and waste is expected to soar. Hediger (2000: 48) challenged people to attempt to understand sustainability holistically with respect to the what, how and by whom questions pertaining to sustainability. Beretta, Stoessel, Baier and Hellweg (2013) identified the food industry as the third largest contributor of waste, and Jones (2004) stated that the airline industry formed a large part of the food service and hospitality

industry. Jacobs and Hoeller (2015) estimated global airline travelling to 6.3 billion in 2013 producing more than 3.15 million tons of waste. El-Mobaidh, Razek and Lassheen (2006) estimated cabin food waste from economy class of Egyptian Airline to 41% of the food served per annum. This was equated to 2,410,227,000 kilojoules of energy which is the equivalent of 669,561.1 kW-hr of electricity wasted. According to the Guardian (2017) in 2016 alone the airline industry generated 5.2 million tons of waste that ended up in incinerators of landfill sites costing them about £400 million and these figures are expected to double in 15 years. The big question then is what is it that the world wants to sustain when so much of the most limited resources are going to waste.

South Africa faces a number of environmental and socio-economic challenges such as drought and resultant water shortages as Durban's dams stood at 20% lower than at the start of 2010 (The Water Project, 2018), Cape Town declaring water restrictions (African Blue Tours, 2016), and Nelson Mandela Bay dams dropping below 'critical low point of 40%' (Donnenfeld, 2018); power supply outrages as Eskom scrambles to 'to get supplied of coal to six power stations where stockpiles are critically low' to avoid reinstatement of load shedding (Times Live, 2018); starvation estimated at 14 million people, 26% of households facing hunger (Wilkinson, 2016), about 53 children under the age of five dying every day of preventable causes such as malnutrition (Lake, 2017) and about 20 of 2000 children admitted every day dying of acute malnutrition (Ledger, 2017).

Rok and Mulej (2014) were confident that the airline catering and hospitality industry in South Africa can play a role in alleviating these social and economic problems. In a country facing so many socio-economic challenges and where one in every five South Africans is not sure where their next meal would come from pointing to food insecurity and poverty (Schwabe, Albiac-Murillo, Connor, Hassan & Meza González, 2013; FoodBank SA, 2009) food waste of any form is concerning, unsustainable and irresponsible (Nahman, de Lange & Oelofse, 2012).

Literature review

Aviation has always associated flying with luxury, quality and abundance. Consequently, onboard service expectations are high (Nilsson, 2011). When looking at academic studies on food waste such as those by Sonnino and McWilliams (2011), Whitehair, Shanklin and Brannon (2013) as well as Vandermeersch, Alvarenga, Ragaert and Dewull (2014), it seems almost impossible to study food waste independently of motives to improve sustainability and reduce waste. According to Birisci and McGarvey (2017 and also Sihlobo and Kapuya, (2015) food waste which is a result of overproduction, compounds the problem of greenhouse gas emission, landfilling and environmental degradation. Babalola (2013) explained food waste as a resource management, economic as well as a moral problem.

Sel, Pinarbasi, Soysal and Cimen (2017) and Birisci and McGarvey (2017) pointed to the management challenges associated trying to balance food waste reduction and averting food shortfall which may impact negatively on the competitive strategy of an airline. A glance at this serving tray (figure 1) indicates a lot of possible edible waste excluding packaging. Even at home people do not eat so much of different food items in one serving. Much as airlines have to strive to create and maintain competitive advantage, the issues of triple bottom line should be taken seriously. There is neither sustainability nor competitive advantage in the industry that wastes £billions per year in order to fly regularly. The cost to be competitive defeats the meaning and purpose of competitiveness in terms of efficiency.

Figure 1: One passenger serving
Source: The Guardian (2017)

Population growth, rising global warming and resultant climate change and droughts lead to food scarcity and starvation. It is estimated that about 868 – 900 million people worldwide go to bed hungry (Kings, 2013), in the same world where about $750 billion goes to food waste, 1.4 billion hectares of agricultural land being wasted due to food that ends up in incinerators and landfill sites. In support Lipinski, Hanson, Lomax, Kitinoja, Waite and Searchinger (2013) converted these figures to about one in every eight people being under-nourished in the same world where one third of global food supply goes to waste (da Silva, 2013). In support Mangena (2016) predicted that in the near future wars will break out due to food scarcity. Rowe (2015) found that within the catering industry there was not enough concern or awareness on the industry's contribution to climate change. Hasachoo and Masuchun (2015) argued that onboard menus were designed in advanced and the cooking process begins long before departure time but the number of passengers onboard is finalised only minutes before departure, meaning that even half-full planes are loaded with full capacity food stuff.

Figure 2 illustrates that food waste is produced in the kitchen during preparation as well as on plate during consumption (Kansas City, 2012). The study focused on post-consumer food waste with the view to quantifying it and suggesting possible solutions. Kummu, de Moel, Porkka, Siebert, Varis and Ward (2012) estimated wasted resources due to food waste to 24% of fresh water used for watering, 23% of cropland area, 23% of fertilizers, 22% of global green gas emissions worldwide. Mason, Boyle, Fyfe, Smith and Cordell (2011) added lost revenue, energy costs, labour costs, lost materials, disposal costs, liability and risk to the list of hidden costs of food waste. Other costs could include time, skill, depreciation of resources, lost landfill sites, environmental costs and others.

All this loss points to unsustainable production and consumption patterns in the same world where almost 800 million people do not know where their next meal will come from (Mannik, 2016) while at least one of every three foods that are prepared gets disposed whilst more than half of it would still be edible (The Waste and Resources Action Programme's (WRAP) report (2009); Melikoglu, Lin and Webb, 2013); The Food Bank SA (2009). Nahman, De Lange and Oelofse (2012) quantified the amount of food that goes to waste to R32.5 billion each year in South Africa alone.

Figure 2: Categories of food waste
Source: Kansas City (2012)

Methodology

This study focused on food waste within South African Airways (SAA) paying particular attention to economy class of inbound flights on domestic, regional and international routes from over 40 destinations covered by SAA (SAA time table, 2015). Data were collected at the Johannesburg kitchen which is the head office of Air Chefs South Africa using the waste audit form. The waste audit form design was informed by the menu structure of SAA. This kind of data collection tool was used by Ross (2015) who conducted a waste audit to quantify food waste in the airline production kitchen.

Economy class food waste was audited and categorised on a separate table set purely for this exercise. Trolleys returning from SAA's domestic, regional and international flights to the offloading bay (sanitation area) at Air Chefs were stripped and food waste was counted on the stripping tables as trolleys were being stripped and equipment and food separated. Data collectors stood on three different points for data collection. These points were for domestic, regional and international flights.

To ensure safety, sanitation standards and to be safety compliant, hair nets, plastic aprons, face masks and safety boots were provided by the company. Clipboards with waste audit forms and a calculator were also at the data collection table. Countable items such as pre-portioned and individually wrapped cheeses, crackers, butter portions, jam portions, salad dressings, breads and chocolates per flight were counted and recorded on to the allocated spaces on the waste audit forms. Cooked foods such as hot meals, salads and desserts were separated, weighed and amounts were recorded in grams on the allocated spaces on the waste audit forms. The figures were represented on to waste audit forms in quantity and kilograms. Each flight's food waste was counted and weighed individually to allow room for the study to uncover maximum information. Four days of data were collected, recorded and analysed to inform the results of this study.

Findley, Daum and Stineman (1990) recommended that data collection, for the first few subjects, must be conducted by the primary investigator (PI) but can later be delegated. To clarify ambiguity and ensure understanding, the PI trained all data collectors and answered all questions about the data collection expectation and process. Site visits, regular meetings, spot checks and data review for accuracy were done throughout the data collection process. In a study conducted by Ross (2014) who assessed food waste in an airline caterer's production kitchen, data was collected over a period of two days to draw the airline's average food waste. A four-day average was generated in this study.

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Findings

Figure 3 illustrates high quantities of waste just over a 4-day period. Across all routes the highest waste in terms of portions were butter (4385), dessert (4283), starter (4168), followed by filled bread rolls (3821) and Cheese (3104). These results have significant implications for the management of an airline that is reported to be 'battling a weak balance sheet', 'in deep trouble' and is said to have incurred a loss of R5.6 billion for the year ended March 2017 much higher than the R1.47 billion it reported in 2016 (Khumalo, 2017; Mkhwanazi, 2018). The amount of money SAA loses on food waste alone would help in cutting down the airlines losses over a 365 day period.

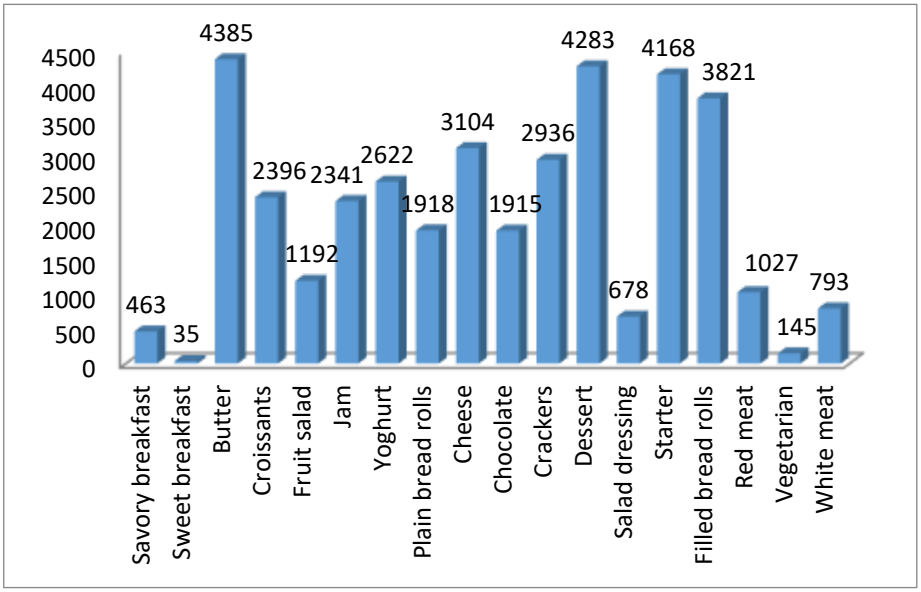

Figure 3: Food items waste averages over a 4-day period

Table 1 shows that over the 4-day period SAA lost an estimated R94 343.69 on food waste derived from international routes alone. This figure resulted from a total loss of approximately 667 834 grams of food wasted over a 4-day period. Based on these figures, SAA would be losing a staggering R8 608 861.71 per year on food waste on international flights alone. This loss does not include a lot of hidden costs as discussed in the literature review section. Food items that created most waste (over 60 000 grams) over the 4-day period were yoghurt (86 160g), dessert (84 000g), red meat hot meals (78 240g), a starter (76 800g) and savoury breakfast hot meal (64 800g). These figures are very significant in terms of informing the company what food items to remove from international service trays.

Table 2 displays data on food waste from regional routes. Over the 4-day period when data were collected SAA lost more money on food waste on its regional routes (R112 948.88) than its international routes (R94 343.69). This means that SAA lost an average of R28 237.22 worth of food per day on regional routes alone amounting to R10 306 585.30 in a year. On regional routes the food items that contributed most to waste were starter and dessert followed by red meat hot meal frilled rolls and white meat hot meal.

Table 1: International sector waste in count, weight and price

Weight and price values – International sectors					
Food Item	**Total**	**Weight in grams(g)**	**Price in Rands(R)**	**Total in grams(g)**	**Total cost in Rands(R)**
Savory Breakfast hot meal	270	240	19.36	64800	5 227.20
Sweet Breakfast hot meal	35	240	22.32	8400	781.20
Butter	1576	8	1.67	12608	2 631.92
Croissants/bread	1101	30	4.28	33030	4 712.28
Fruit salad	990	60	4.81	59400	4 761.90
Jam	1924	10	2.39	19240	4 598.36
Yoghurt	1077	80	2.81	86160	3 026.37
Red meat Hot meal	326	240	32.52	78240	10 601.52
White meat Hot meal	225	240	29.89	54000	6 725.25
Vegetarian	40	240	30.41	9600	1 216.40
Bread	423	30	2.76	12690	1 167.48
Cheese	1147	8	4.73	9176	5 425.31
Chocolate	1105	8	13.31	8840	14 707.55
Crackers	2325	10	2.19	23250	5 091.75
Dessert	1400	60	9.50	84000	13 300.00
Starter	1280	60	5.42	76800	6 937.60
Filled rolls	230	120	14.92	27600	3 431.60
Total				**667 834**	**94 343.69**

It would be advisable for SAA to take a careful look at the information that emerges from data and reduce servings of such food items on regional flights as it would obviously save the company some money. The company should instead conduct a study to find out from the regular flyers on these routes what their food preferences are, instead of serving meals that are similar to those offered on international routes.

On SAA's domestic routes frilled rolls accounted for most of the waste in both grams and rand. Clearly this food item is not popular with national travelers and it should be removed from the list. Frilled rolls alone caused SAA a R43 133.72 loss in a 4-day period as illustrated on table 3.

Other food items that could be removed from the domestic trays are yoghurt (96 080g) and red meat hot meals (R9 138.12) because they also accounted for a lot of waste in terms of grams and rand value over the 4-day period. Croissants/bread (30 870g/R4 404.12 and Starter (47 520g/R4 292.64) also contributed a lot on the waste register both in terms of grams and amount of money just over a 4-day period.

Table 2: Regional sectors waste in count, weight and price

Weight and price values - Regional sectors					
Food Item	**Total**	**Weight in grams (g)**	**Price in Rands(R)**	**Total in grams(g)**	**Total cost in Rands(R)**
Savory Breakfast hot meal	230	220	19.36	50600	4 452.80
Butter	2809	8	1.67	22472	4 691.03
Croissants/bread	266	30	4.28	7980	1 138.48
Fruit salad	202	60	4.81	12120	971.62
Jam	1924	10	2.39	19240	4 598.36
Yoghurt	344	80	2.81	27520	966.64
Red meat Hot meal	420	240	32.52	100800	13 658.40
White meat Hot meal	328	240	29.89	78720	9 803.92
Vegetarian	105	240	30.41	25200	3 193.05
Bread	1495	30	2.76	44850	4 126.20
Cheese	1957	8	4.73	15656	9 256.61
Chocolate	810	10	13.31	8100	10 781.10
Crackers	1693	10	2.19	16930	3 707.67
Dessert	2099	60	9.50	125940	19 940.50
Salad dressing	678	10	1.47	6780	996.66
Starter	2096	60	5.42	125760	11 360.32
Filled rolls	700	120	14.92	84000	10 444.00
Totals				**772 668**	**112 948.88**

Domestic flights are short and passengers may not need all that food including starters, main meal and dessert for a 3 hour flight maximum. The airline could conduct a study to find out if passengers would prefer to save about a R100 and be served no meals. In this way SAA could save a lot of money of cabin crew salaries, waste removal and other hidden costs of food waste. Figure 2 indicates clearly that butter (15%), dessert (11%) and a starter (10%) contributed more to food waste from all routes. This would serve as a good starting point for SAA to prune its service trays or provide such food items only on request, which would mean that the amount bought and wasted would be reduced drastically.

As much as the history of inflight catering was meant for the more affluent people (Foss, 2015), it is important to realise how much the industry has evolved to a point that it is now just another form of transportation in some cases for people rushing to work and meetings. This reality may be the very reason why there has been an increase in low cost airlines that offer transportation more than food service (Jacobs and Hoeller, 2015).

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Table 3: Domestic sectors count, weight and price

Domestic					
Food Item	**Total count**	**Weight in grams (g)**	**Price in Rands(R)**	**Total in grams (g)**	**Total cost in Rands(R)**
Savory Breakfast hot meal	62	220	19.36	13640	1 200.32
Croissants/bread	1029	30	4.28	30870	4 404.12
Yoghurt	1201	80	2.81	96080	3 374.81
Red meat Hot meal	281	240	32.52	67440	9 138.12
White meat Hot meal	210	240	29.89	50400	6 276.90
Dessert	784	60	9.5	47040	7 448.00
Starter	792	60	5.42	47520	4 292.64
Filled rolls	2891	120	14.92	346920	43 133.72
Totals				**699 910**	**79 268.63**

Also, all big airports provide restaurant facilities both outside and inside check-in points. The study also looked into the total waste in grams over the 4-day period from all the routes services by SAA. It was depressing to realise the amount of food that got wasted just over such a short period of time in the same country where a third of the population scraps for next meal (Food bank SA, 2009). Figure 5 reflects the totals of food wasted over the 4-day period that data were collected.

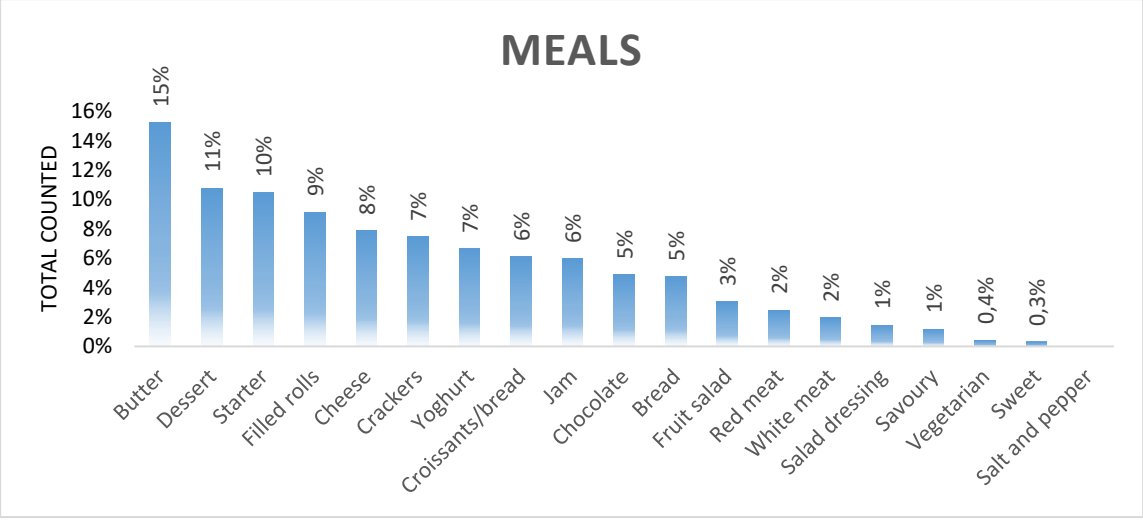

Figure 4: Post-flight food waste percentages

The most wasteful routes over the 4-day period were the regional ones with a total waste of 772 668 grams of food. These routes were followed by the domestic routes at 699 910 grams of food

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going to waste over the 4-day period. It was unexpected that the international routes would be the ones producing the least food waste (667 832g) as illustrated on figure 5.

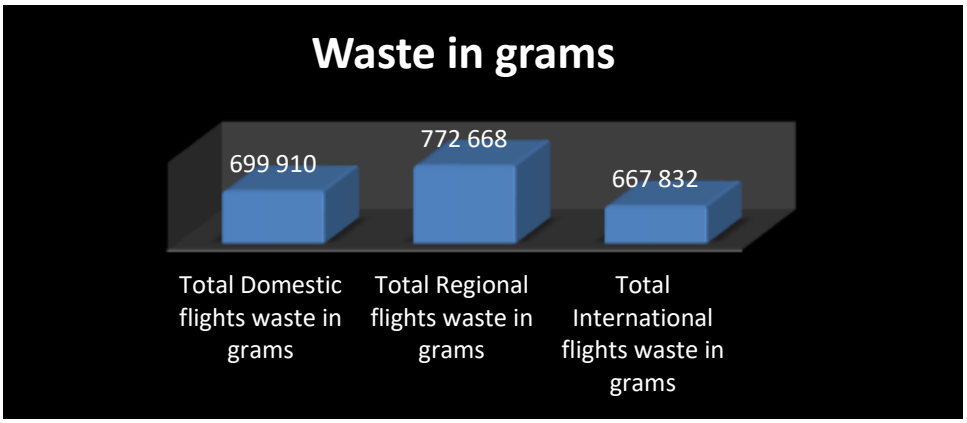

Figure 5: All sectors food waste in grams

Unexpected as it was, it did make sense because they were much longer and passengers could get hungry a number of times when the flight is 10 hours and more. These grams of food waste were finally converted into loss to SAA in monetary terms. Figure 6 captures the amount of money lost to SAA due to food waste just over a 4-day period. As expected from food loss in grams, the regional routes cost SAA more waste in monetary terms (R112 948.88), followed by the international routes at R94 343.69 and finally, domestic routes accounting for the total waste of R79 268.63. The food stuff loaded on international routes tends to more expensive as they are long haul flights.

Figure 6: All sectors food waste in Rands

This could be the reason for international waste costing SAA more in monetary terms even though its waste was less than domestic routes in terms of weight. Papargyropoulou (2014) argued that the food waste hierarchy would be the first step to managing food waste, and this is to reduce it both during preparation and post-consumption. This may be followed by educating passengers about the crisis of food scarcity and the issues of sustainable development using in-flight magazines, during in-flight commercials, at airports as well at on TV channels at home. Getting them to actually see statistics regarding global hunger and the amount of food waste that airlines

cause as well as the environmental impacts thereof, would sensitise passengers and influence their eating behaviour while on board as suggested by Jones and Timmerman (2014).

In a simplified way, if the total losses incurred over the 4-day period are multiplied by the total number of days in a year, SAA lost in the region of R26 148 709 on food waste alone in 2017. If the world is talking about sustainable development and sustainable business operations, just this one great company clearly seems to be unsustainable in its operations.

Conclusion

There is an urgent necessity to find ways to manage food waste by reducing it through proper planning and leaner strategies, educating passengers, giving them the opportunity to select their menu on booking, removing food items that lead to most waste from the serving trays and allowing passengers to request food if they need to eat, reducing the amount of food that is served on domestic routes, research on route preferences and other such economic and environmentally friendly strategies.

The complexities of airline catering were discussed, however, on shorter routes, passengers can be given an option to save money and be served no food because they obviously pay for the food that ends up in incinerators and landfill sites. The airline industry has clearly evolved over time and some passengers are rushing to meetings and work and eating is not part of their agenda. This is particularly true for early morning flights. Just coffee, tea, juice, water with a sandwich may do. Passengers should be encouraged to utilise airport eating facilities to reduce the burden of on board catering and sometimes having to eat because food has been served and passengers know that they have paid for it. SAA would save billions a year through reduction of food disposal amounts, cabin attendants, reduction of kitchen staff, improved operational efficiencies, efficient procurement processes, and leaner strategies which an airline that is posting R billions of losses quarter after quarter (Omarjee, 2018) desperately needs. Irani, Sharif, Lee, Aktas, Topaloglu, van't Wout and Huda (2017) are adamant that improved operational efficiencies could make more food available to those in need without 'more farm output'.

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