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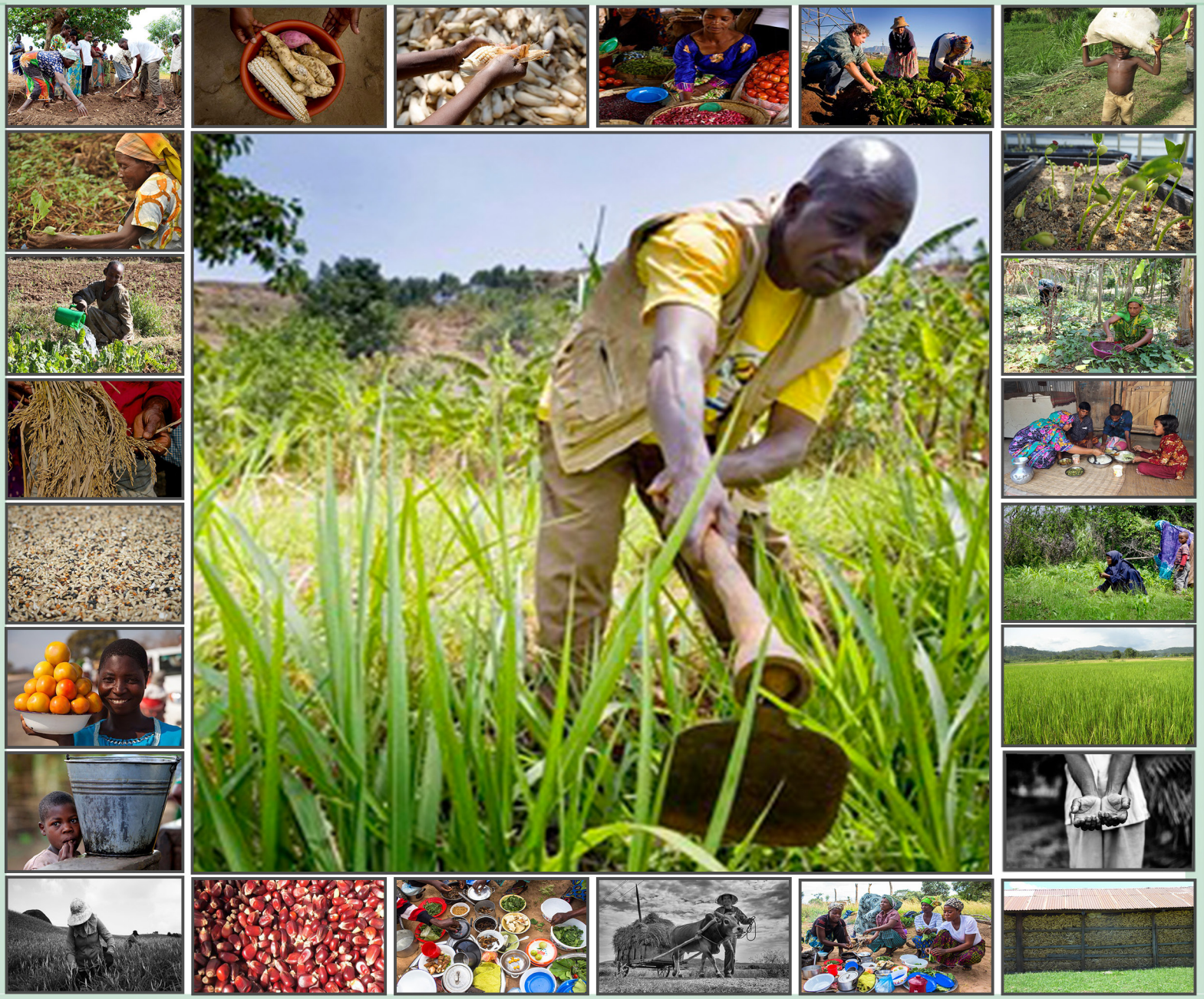

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UniKassel & VDW, Germany-October 2021

Editorial

Biodiversity protection and sustainable development

Dr. Erhan Sulejmani hold an MSc and a PhD from Ss. Cyril and Methodius University in Skopje and İnönü University. His research career includes academic and industrial research in the field of dairy science and technology, with dairy chemistry and physics as a central theme. His research topics have ranged product and process optimization to the role of dairy products in a sustainable diet. His postdoctoral studies were related to dairy chemistry and food bioactive components. He currently com-

Without greater investment in biodiversity protection and sustainable development, the eradication of hunger will not be possible. Biodiversity is the foundation of healthy and sustainable food systems. It is the key to tackling global hunger, from pollinator protection to improving soil fertility and building resilience to climate change. Therefore, to protect our future, it is necessary to increase the investment in the current biodiversity.

These nature-based solutions encourage proactive conservation, management, and restoration of ecosystems and biodiversity that tackle climate change, food and water safety, and human health.

Organic fields have around 30% more biodiversity. Besides, organically farmed animals enjoy a higher degree of animal welfare and take fewer antibiotics.

Moreover, organic farmers have higher incomes and are more resilient, and consumers are getting more aware of the importance of organically produced food.

The Action plan for organic production in the EU aims to boost the production and consumption of organic products, and achieve the European Green Deal target of 25% of agricultural land under organic farming by 2030. . The plan is designed to provide the already fast-growing organic sector to achieve the 25% target through 23 actions structured around boosting consumption, increasing production, and further improving the sustainability of the sector to ensure balanced growth of the sector (2).

Achieving global food security remains a key challenge for the future, given the continued increase in population, dietary shifts, and global climate change.

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Therefore, more attention has been shifted to agricultural intensification, followed by a mechanism to increase production, as it is the main cause of food insecurity. Diverse agroecosystems are likely to perform better today and under changing environmental conditions because a broader range of functions and responses to change will stabilize the system (3).

Our understanding about how much of human well-being depends on biodiversity and ecosystems has increased, while conversely, our efforts to protect biodiversity have continued to fall short. The 2019 Global Assessment of Biodiversity and Ecosystems Services underscored that most of nature's contributions to people are not fully replaceable, and some are irreplaceable. Besides, the rate of global biodiversity degradation during the past 50 years is getting unprecedented in human history (4).

Clarity on the factual relationship between biodiversity and health is a more recent international development. Alternatively, reduced human contact with biodiversity may lead to reduced diversity in the human microbiota, weakening the human microbiome's immune-regulatory role and the onset of non-communicable diseases (type 1 diabetes, multiple sclerosis, inflammatory bowel diseases) (5,6).

While there are concerns in some countries that the agrifood system is becoming more cloudy, more support to consumers to make healthier and more sustainable food choices is definitely needed. it is for sure that many stakeholders are to be required to contribute to a future food system that provides enough safe, authentic and healthy food that insure a current and future healthy lives for all people (7,8). Policymakers have a key role in this regard and in supporting opportunities to realize efficiencies and reduce food waste (9).

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Research Paper

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Demand for selected plant-based protein among the staff of a tertiary institution in Nigeria

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Keywords

Plant-based protein; budget shares; compensated elasticities; uncompensated elasticities; QUAIDS

Increasing demand for animal protein has negative consequences on human health and the environment. Thus, the need for a replacement of animal protein with plant-based protein in the human diet is necessary. Therefore, the demand for selected plant-based protein (PBPs) (soybean, mushroom, potato, and cowpea) was assessed. Data collected from 343 staffers from the University of Ibadan were analysed using descriptive statistics and Quadratic Almost Ideal Demand System. Mushroom and soybean were luxury goods, but demand for mushrooms was more elastic than soybean. Potato was considered a necessary good. Expenditure elasticity for cowpea was, however, found to be just unitary. The selected plant-based proteins were normal goods.
Furthermore, all the compensated own-price elasticities (except mushroom) were less than one (in absolute terms), indicating that they are price-inelastic. They ranged between (-0.14) for soybean and (-0.62) for potato. Hicksian elasticities showed that mushroom was a substitute for cowpea and potato. Cowpea and potato were also substitutes for each other. Socio-economic factors influencing demand were years of schooling, access to market, prices of the PBPs and marital status of the respondent.

1. Introduction

Red meat is an important protein source, but it negatively affects health and can be substituted with plant-based protein foods (Martha *et al.*, 2019). These plant-based protein foods can be in modern forms, designed in such a way that satisfies the need of the consumer in terms of texture and flavour that are desirable; and can be made of soybeans and other protein-rich crops, including grass (Linnemann and Dijkstra, 2000). Food safety and health concerns have become crucial factors for a constantly growing number of consumers when purchasing food products (Zhu *et al.*, 2006). Thus, changing attitudes towards food consumption increases demand for meat substitutes or meat alternatives (Zhu and van Ierland, 2005; Zhu *et al.*, 2006).

Increased consumption and production of animal proteins is linked to increased greenhouse gas emissions and overutilization of water, which leads to rapid depletion of the Ozone layer; thereby causing climate change, global warming and ultimately, posing a threat to human existence (Wu *et al.*, 2014; Aiking, 2014). Arguably, the best solution to reduce problems associated with meat consumption would be to re-

place meat with plant-based protein foods (Markiewicz, 2010). One of the key drivers of meat-alternative product choice is the growing interest in healthy eating, including incorporating more plant-based foods into the diet and expectations of higher quality meat-alternative products (Sadler, 2004). The protein content of pulses (beans, peas and lentils) is higher than that of meat, fish, eggs or fresh milk, while cereals have intermediate content of proteins (Grigg, 1995). Although the differences in protein content in foods are significant, it is important to remember that malnutrition is caused by the lack of proteins in the diet and insufficient calorie intake (Aiking, 2011). A plant-based diet can also provide the essential amino acids when combined correctly with cereals and pulses.

Adherence to plant-based diets offers an advantage over animal-based diets concerning promoting longevity and prevention and management of chronic diseases, including heart disease and type2 diabetes (Ashaye *et al.*, 2012; Tuso *et al.*, 2013; McMacken and Shah 2017; Lynch *et al.*, 2018). A plant-based diet, including the plants of interest for this study, is rich in health-promoting nutrients and compounds like vitamins, minerals, fibre, and phytochemicals, even whilst providing the body with protein. Plant-based sources of protein of interest in this study- potato, cowpea, soy, and mushroom- are rich in vitamins, energy, non-essential amino acids, and most of all, protein. They are also low in cholesterol, unlike their counterpart animal-based protein foods. Cowpea (*Vigna unguiculata*) is the most consumed legume in Nigeria, and it combines the benefit of being a pulse with being a legume containing 21.1-29.9% protein and rich in essential and nonessential amino acids but low in fat content (1.2-1.8%) (Horax *et al.*, 2004; Onimawo 2010; Ajeigbe *et al.*, 2008). On the other hand, mushrooms and soybean are considered complete proteins, as they both contain all essential amino acids and possess 3.1-36g of protein in every 100g, respectively (United States Department of Agriculture, 2019). Soybeans are the only vegetable food that contains all eight essential amino acids with no cholesterol and are low in saturated fat (Lindsay & Claywell, 1998; Dudek, 2001). Furthermore, potato (Solanum tuberosum) protein is one of the most valuable non-animal proteins containing about 75 per cent water-soluble essential amino acids, and its nutritional value for humans equals that of a whole egg (Kowalczewski 2019). The average protein content of potatoes is 2% on a fresh weight basis (USDA, 2019). Although its protein is the least among the four selected plant-based proteins, its dry weight protein content is similar to that of cereals and is very high compared to other roots and tubers (FAO, 2008).

Nigeria ranks amongst the top potato producers in terms of area of land cultivated and production generally. In potato production, Nigeria is the fourth biggest producer in sub-Saharan Africa and has almost as much land for potato farming as Germany (Ugonna *et al.*, 2013). Abba (2013) stated that Nigeria is the largest producer of cowpea in Africa, with increasing demand over the last decade. A FAOSTAT report in 2014 listed Nigeria as the highest producer of cowpea in the world. Plant-based protein may be a cost-effective way to improve diet quality at all income levels (Aggarwal *et al.*, 2019). The plant-based protein sources of interest in this study are available all year round and are well adapted to the Nigerian climatic condition.

Relevant literature on demand and consumption for animal protein sources, other than plant sources, abound (Abdulai, 2004; Bielik and Šajbidorová, 2009; Ogunniyi *et al.*, 2012; Lusk and Tonsor, 2016). Although Wild *et al.* (2014) worked on a plant-based alternative to meat and its global acceptance, there is a dearth of empirical studies on demand for plant-based protein sources, especially in Nigeria. This study differs from related studies in that it estimated elasticities of selected plant-based protein foods, which is scarce in the literature.

2. Methodology

Primary data was used to collect information from 400 members of the University of Ibadan in 2019, using a questionnaire. The selection was made through a multi-stage sampling procedure (Figure 1). At the first stage, thirty per cent of each faculty (13) and the administrative units (18) were selected. This resulted in four (4) faculties and five (5) administrative units, respectively. At the second stage, 50 per cent of Departments in each chosen faculty were randomly selected. Then, the questionnaire was administered to 30 per cent of their academic staff and 50 per cent of their non-academic staff. For the administrative units, 30 per cent of senior staff and 10 per cent junior staff

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were randomly selected proportionate to size. Information on socio-economic factors such as age, sex, income, household size, etc., per capita expenditure on the selected crops and their expenditure on other food and non-food items were obtained from the respondents.

Descriptive statistics (mean, standard deviation, frequency and percentage) were employed to describe socioeconomic and other relevant variables considered in this study. The complete food demand estimation was carried out using Quadratic Almost Ideal System (QUAIDS) model. The QUAIDS model assumes that household preferences belong to the following quadratic logarithmic family of expenditure functions:

$$\ln c(u \cdot p) = lna(p) + \frac{ub(p)}{1-\lambda(p)b(p)u} \quad (1)$$

Where u is utility, p is a vector of prices, $a(p)$ is a function that is homogenous of degree one in prices, $b(p)$ and $\lambda(p)$ are functions that are homogeneous of degree zero in prices. The corresponding indirect utility (V) function for the plant-based protein of interest is specified as follows:

$$\ln V = \{[\frac{\ln m - lna(p)}{b(p)}]^{-1} + \lambda(p)\}^{-1} \quad (2)$$

Where m is the total expenditure, ln $a(p)$ is the price index having the translog form expressed as:

$$lna(\mathbf{p}) = \alpha_0 + \sum_{i=1}^{j} \alpha_1 lnp_i + \frac{1}{2}\sum_{i=1}^{j}\sum_{i=1}^{j} \gamma_{ij} \ln p_i \ln p_j \quad (3)$$

b(**p**), which is Cobb-Douglas price aggregator takes the following specific flexible functional form:

$$b(\mathbf{p}) = \prod_{i=1}^{j} p_i{}^{B_i} \quad (4)$$

$$\lambda(\mathbf{p}) = \sum_{i=1}^{j} \lambda \ln p_i \text{ where } \sum_{i=1}^{j} \lambda_i = 0 \quad (5)$$

Where i=1; and j denotes the number of plant-based protein inputted into the demand model. Deaton and Muellbauer (1980) proposed an AIDS model has an indirect utility function given by equation (1), but with $\lambda(\mathbf{p})$ set to zero. The specification of the functional forms for $a(\mathbf{p})$ and $b(\mathbf{p})$ in QUAIDS is similar to their specification in AIDS, in which they are made to be sufficiently flexible to represent any arbitrary set of first and second derivatives of the cost function (Bopape, 2006). Application of Roy's identity or Shepard's Lemma to the cost function in equation (5) gives the QUAIDS model budget shares as:

$$w_i \frac{\partial lna(\mathbf{p})}{\partial lnp_i} + \frac{\partial lnb(\mathbf{p})}{\partial lnp_i} (\ln x) + \frac{\partial \lambda}{\partial \ln p_i} \frac{1}{b(\mathbf{p})} (lnx)^2 \quad (6)$$

The corresponding expenditure share equation is:

$$w_i = \alpha_i + \sum_{j=1}^{j} \gamma_{ij} \ln p_j + \beta_i \ln\left[\frac{m}{a(\mathbf{p})}\right] + \frac{\lambda_i}{b(\mathbf{p})}\{\ln\left[\frac{m}{a(\mathbf{p})}\right]\}^2 + Z_i + \varepsilon_i \quad (7)$$

Where w_i is the budget share, allocated to the plant-based proteins i (potatoes (P), soybean (S), cowpea (C), mushroom (M); and m is the per capita expenditures on all commodities; γ_{ij} is the effects on the budget of item i (individual plant-based protein) of one per cent change in the prices of other crops in the basket j (all the plant-based protein of interest in the study); λ_i is lagrange multiplier (vector of non-zero element) is a monotonically decreasing function of probability that the selected household purchased the plant-based protein; m is household's total expenditure on food; Z is a vector of other independent variables described in Appendix I (including age, gender, highest educational attainment, distance to market, staff category, and staff level); ε_i is the error term; and α_i, β_i, and λ_i are parameters to be estimated. α_i is an average value of budget share in the absence of price and income effects, β parameters determines whether the individual crops are perceived as luxuries or necessities. When $\beta_i > 0$, an increase in m, leads to an increase in w_i, so that good i is a luxury. Similarly, $\beta_i < 0$ for necessities p_j is the price of each of the plant-based protein of interest in the study.

The budget share of individual food group was calculated thus:

$$W_{Pi} = (P_{P_b i} \cdot Q_{P_b i})/X_{P_b}$$

Where W_{Pi} is the budget share of the *ith* crop in the basket of plant-based protein (P_b), relative to total expenditure in the basket; and QPbi is the basket of ith plant-based protein (i = 1, 2, . . . , N) in order to overcome the problem of adding up different quantity of food consumed which are not of the same form; P_{Pbi} and Q_{Pbi} are the price and quantity of *i-th* food in basket P_b, respectively.

$$W_{Pi} = \frac{X_{P_b}}{X} = The\ budget\ share\ of\ basket\ P_{bi}, \quad (8)$$

$$X_{P_b} = \Sigma P_{P_b i} Q_{p_b i} = total\ expenditure\ in\ basket\ P_b \quad (9)$$

Differentiating equation (6) with respect to ln *m* and ln *pj*, respectively, give:

$$\mu_i = \frac{\partial w_i}{\partial \ln m} = \beta_i + \frac{2\lambda_i}{b(\mathbf{p})}\left\{\ln\left[\frac{m}{a(\boldsymbol{p})}\right]\right\} \quad (10)$$

$$\mu_{ij} = \frac{\partial w_i}{\partial \ln P_I} = \gamma_{ij} - \mu_i\left(\alpha_j + \sum_k \gamma_{jk} ln\, P_k\right) - \frac{\lambda_i \beta_j}{b(\mathbf{p})}\left\{\ln\left[\frac{m}{a(\boldsymbol{p})}\right]\right\}^2 \quad (11)$$

The budget elasticities are then given by $e_i=(\mu_i/w_i)$. With a positive β and a negative λ , the budget elasticities will appear to be larger than unity at low levels of expenditure and less than unity as the total expenditure increases. Commodities have the features of luxuries at low levels of total expenditure and necessities at high levels.

3. Results and Discussion

Distribution of the consumers showed a male-dominated (67.6%) workforce with a modal age group of 41-50 years and a household size of five to eight members (Table 1). The mean age and household sizes were 44.7±8.95 years and 5±1.51, respectively (Appendix II), depicting an active working population in the university. A typical worker was a married (93.0 %) non-teaching staffer with post-secondary educational attainment, which is likely to increase awareness of the importance of plant-based protein foods in the human diet. The mean income stood at N180,635.20±142,540.60 ($501.76 ±395.95) per month (Table 4.2). The highest proportion of the respondents (35.9 per cent) earned between N100,001 - N200,000 ($277.78 – $555.56) monthly income, while only 27.7 per cent earned below $277.78. This suggests low remuneration of staff in the institution, which can suppress the demand for white meat.

Level of demand for plant-based proteins

Cowpea had the highest expenditure share (₦243.81), while mushroom (₦1.46) had the least (Table 2). This suggested that demand for cowpea was highest amongst the selected plant-based proteins, while the least was mushroom.

Determinants of demand for selected plant-based protein foods

Results showed that the coefficients of the squared per capita expenditure (lnEXPD2) on plant-based protein foods (soybean, mushroom, potato, cowpea) were significant (Table 3) for all the equations indicating that the staff's response of their demand to increase in expenditure was non-linear. Thus, supporting the rejection of the null hypothesis that the quadratic expenditure term is zero. This unveils the suitability of the QUAIDS model over the traditional AIDS model.

The years of schooling of staff and staff categories positively affected the demand for soybean (Table 3). These results imply that as the frontiers of knowledge of the respondents are broadened, staff tended to demand more soybean owing to exposure to the numerous benefits that can be acquired from soybean consumption. Furthermore, an academic staff member was more likely to increase demand for soybeans than a non-academic staff member. Similarly, being a senior staff will also increase the demand for soybean than being a junior staff. The staff category and staff level further showed that as consumers' education increased and they attained higher ranks in their respective careers, their demand for mushrooms also increased.

Furthermore, marital status negatively affected mushroom demand, while household size, distance to market, years of education, staff category, and level had a positive effect on mushroom demand. This inferred that being married, with additional mouths to feed, reduced the demand for mushrooms. This may be due to the assumption that the consumer is rational and replaced the consumption of luxury goods with necessities, increasing expenditure on necessities for the household. Similarly, an increase in distance to market will not limit respondents' demand for mushroom, indicating that they were willing to go to any length to ensure that their demand for mushroom was met.

The price of mushroom had positive effect on its budget share, while the prices of potato and cowpea had negative effect on their respective budget shares. This implied that the budget share of mushroom increased with increase in its own-price, while the budget shares of potato and cowpea decreased with increase in their respective own-prices. In the same vein, demand for mushroom increased with educational attainment, suggesting that education opens the gate of awareness and enlightenment for the con-

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sumer about the importance of highly plant-based protein foods, such as mushroom in the human diet.

Demand for potato increased with an increase in own-price and distance to market but decreased with an increase in the price of cowpea. However, it was lower among married respondents than among their unmarried counterparts. This showed the complementary nature of the two food items, implicitly hinting that potato consumers consumed it with cowpea. Furthermore, demand for cowpea increased with its own-price, owing to the fact that an increase in own-price of cowpea might increase the expenditure share accrued to it. Also, the result implied that demand for

Table 1. Socioeconomic distribution of the respondents

Socio-economic variables	Frequency	Per cent
Sex of respondent		
Female	111	32.4
Male	232	67.6
Age of respondent		
<31	15	4.4
31-40	107	31.2
41-50	135	39.4
51-60	79	23.0
>60	7	2.0
Marital status respondent		
Others	24	7.0
Married	319	93.0
Highest education attainment		
Primary	1	0.3
Secondary	8	2.3
Certificate/Diploma	25	7.3
Bachelors' degree	120	35.0
Master's degree	64	18.7
Ph.D.	125	36.4
Monthly income of respondents		
≤ 100,000	95	27.7
100,001-200,000	123	35.86
200,001-300,000	59	17.2
300,001-400,000	31	9.04
>400,000	35	10.2
Household size		
1- 4	129	37.5
5 – 8	207	60.5
>8	7	2
Staff category		
Non-academic	167	48.69
Academic	176	51.31
Staff level		
Senior staff	223	65.0
Junior staff	120	35.0

cowpea was higher among married individuals, probably because married households tend to have large household sizes. Conversely, household size, distance to market, years of education, staff category, and level had an inverse relationship with cowpea demand indicating a reduction in demand for cowpea whenever there was an increase in any of these variables. Household size having a negative effect on food demand is consistent with the findings of Ashagidigbi *et al.* (2012).

Elasticity of demand for the selected plant-based protein

Expenditure elasticity for soybean, and mushroom, estimated at sample means, had a greater than one value, indicating that they were both elastic commodities. However, mushroom had a higher value, suggesting that it was more elastic than soybean. Besides, both mushroom and soybean were both luxury goods (Table 4). Expenditure elasticity for potato was less than one but greater than zero, signifying that potato is a necessary good; thus, a unit increase in the income of respondents will lead to a less than proportionate increase in the demand for potato. This finding is similar to the findings of Huq *et al.* (2004) for potatoes in Bangladesh. Conversely, expenditure elasticity for cowpea was found to be unitary (1.03), indicating that there will be almost an equal increase in demand for cowpea as the consumer income/expenditure increases by a unit.

Compensated and uncompensated own-price elasticities of demand for selected plant-based proteins

The diagonal matrix showed that all own-price elasticities of the selected food items (except that of soybean) had negative signs, implying that they were normal goods, whose demand declined when their prices increased (Table 5). The positive own-price elasticity for soybean indicated that it was a 'giffen' good, whose demand increased with a proportionate increase in own-price. Estimates of the uncompensated own-price elasticities of demand for soybean, cowpea, and potato were inelastic in absolute terms. However, mushroom was highly elastic in absolute terms, suggesting that it was highly responsive to changes in own-prices.

In addition, all the compensated own-price elasticities in the diagonal matrix carried the expected negative sign implying that the food items were normal goods whose demand declines when their prices increase. However, the elasticities were smaller in magnitude (except for soybean) than the uncompensated/Marshallian own-price elasticities. This implied that price responsiveness of the different plant-based protein items was dependent on expenditure. When expenditure was held constant (that is, not a constraint in the decision process), consumers tended to be less responsive to prices of these items. Furthermore, all the compensated own-price elasticities (except mushroom) were less than one (in absolute terms) indicating that they were price-inelastic, ranging from (-0.14) for soybean and (-0.62) for potato. Similar to uncompensated own-price elasticities, the compensated own-price elasticities for mushroom (-2.0324) were found to be larger in magnitude than others. This implied that the mushroom is more responsive to change in own-prices than other plant-based protein foods.

The uncompensated or the Marshallian cross-price elasticity of demand for the selected plant-based pro-

Table 2. Expenditure share of plant-based proteins

Variable	share	Mean	Std. Dev.
w1	17.78	0.051843	0.14
w2	1.46	0.004255	0.03
w3	79.95	0.233088	0.28
w4	243.81	0.710814	0.30

w1= Expenditure share of soybean; w2= Expenditure share of mushroom; w3= Expenditure share of potato; w4= Expenditure share of cowpea. (prices per kilogram were used in computing the expenditure share)

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Table 3. Determinants of demand for Plant-based Proteins

Variable	Soybean	Mushroom	Potato	Cowpea
Constant	0. .0082	0.3463***	1.7574***	-1.1120***
	(0.2074)	(0.0548)	(0.3059)	(0.3471)
Price coefficients				
ln price of soybean	0.0688			
	(0.0545)			
ln Price of Mushroom	-0.0141	0.0137*		
	(0.0146)	(0.0081)		
Ln Price of Potato	-0.0738	-0.0974***	0.5608***	
	(0.0732)	(0.0187)	(0.1646)	
ln Price of Cowpea	0.0191	-0.0970***	-0.5845***	0.6623***
	(0.0815)	(0.0243)	(0.1726)	(0.2139)
Expenditure and Expenditure squared				
lnEXPD	-0.1010*	0.0651***	0.3854***	-0.3495***
	(0.0530)	(0.0129)	(0.0713)	(0.0813)
$lnEXPD^2$	-0.0050*	0.0038***	0.0269***	-0.0257***
	(0.0030)	(0.0007)	(0.0032)	(0.0040)
Socio-economic Characteristics				
Age	0.0002	0.00004	0.0004	-0.0006
	(0.0002)	(0.00003)	(0.0004)	(0.0004)
MAR_STATUS	-0.0041	-0.0016*	-0.0372***	0.0430***
	(0.0051)	(0.0009)	(0.0118)	(0.0121)
HHSIZE	0.0016	0.0004**	0.0022	-0.0042*
	(0.0010)	(0.0002)	(0.0023)	(0.0006)
DIST_MARKET	-0.00002	0.0001***	0.0004*	-0.0004**
	(0.0001)	(0.0000)	(0.0002)	(0.0002)
Highest_Edu	0.0017***	0.0002**	0.0002	-0.0021*
	(0.0006)	(0.0001)	(0.0012)	(0.0012)
STAFF_CAT	0.0102**	0.0022***	0.0121	-0.0245**
	(0.0046)	(0.0008)	(0.0104)	(0.0107)
STAFF_LEVEL	0.0090**	0.0027***	0.0109	-0.0226**
	(0.0042)	(0.0007)	(0.0095)	(0.0098)

(Figures in parenthesis represent the standard error). *, ** and *** represent levels of significance at 10¸ 5, and 1 percent, respectively.
Age: The age of respondent; MAR_STATUS: marital status of the respondent; HHSIZE: household size of the respondent; DIST_MARKET: distance to market from respondent; Highest_Edu: the highest educational attainment of respondent measured in years of formal education; STAFF_CAT: Staff category of respondent, whether academic or non-academic; STAFF_LEVEL: The respondents rank/level in their job.

teins shows the percentage change in the demand or consumption of an individual selected plant-based protein when the price is increased with respect to any of the selected food items in the study. The uncompensated cross-price elasticities were mainly negative, indicating a complementary relationship among the food items. For example, the cross-price elasticity for soybean and mushroom (-1.4986) indicated that both food items were complements (Table 5). This means that a percentage rise in the soybean price would lead to a less than proportionate decrease (1.5) in the quantity of mushroom demanded. Other pairs of food items having a complementary relationship are soybean and potato (-0.0375), soybean and cowpea (-0.0542), and potato and cowpea (-0.0455).

On the other hand, the uncompensated cross-price elasticity of demand between mushroom and potato (0.0152), mushroom and cowpea (0.0096), cowpea and potato (0.1377) indicated that they were substitutes. Thus, a percentage increase in the price of one pair would lead to a less or greater than proportionate increase in the demand for the other. For example, a per cent increase in the price of cowpea would cause a less than proportionate increase (0.13%) in demand for potato. On the other hand, the compensated or Hicksian cross-price elasticities were mostly positive, indicating substitutions among the food items. Mushroom was considered a substitute for all other food items except soybean, implying that when the price of mushroom increases, there would be a greater than proportionate increase in the quantity demanded of potato and cowpea, respectively. Likewise, cowpea and potato (0.14) were substitutes.

4. Conclusion

This study provides empirical evidence on demand for plant-based protein foods among the staff of a tertiary institution in Southwest using QUAIDS model. Results showed that the consumers spent more on cowpea than the selected plant-based protein foods, while mushroom was the least consumed. However, mushroom and soybean were luxury goods, while cowpea, potatoes and soybean were necessities. Low-income earners were less likely to choose mushroom and soybean but were more likely to choose cowpea. All the food items except mushroom were price inelastic. From the foregoing, there is a need for increased production of the selected plant-based proteins, especially cowpea, as it is the most demanded among the selected plant-based proteins. The high level of demand for cowpea in the study area also leads to higher market prices. Agricultural and nutritional policymakers should intensify efforts for public enlightenment on the numerous benefits of plant-based protein, especially mushroom and soybean, which were the least demanded plant-protein foods. Increased demand for these food items will reduce the price of cowpea and potatoes, which were their substitutes.

Furthermore, government intervention towards the marketing and pricing of mushroom and soybean is recommended to take it from 'luxury good' status to 'necessity good' status, thereby increasing the demand for these food items. Conclusively, the "one cap fits all" policy cannot be prescribed to promote the selected PBPs' consumption among consumers. However, an integrated food policy that takes into account the socioeconomics of consumers, such as increasing their years of schooling, access to market and income, would increase consumers' demand for plant-based protein foods.

Conflict of interest

Authors declare no conflicts of interest.

Table 4. Expenditure elasticity of plant-based proteins

Food items	Elasticity
Soybean	2.00
Mushroom	2.73
Potato	0.66
Cowpea	1.03

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Table 5. Uncompensated and compensated elasticities of demand

Food Items	Soybean	Mushroom	Potato	Cowpea
Marshallian/uncompensated Elasticity				
Soybean	**0.0353**	-1.4986	-0.0375	-0.0542
Mushroom	-1.1424	**-2.0440**	0.0152	0.0096
Potato	-0.4488	0.5155	**-0.7708**	-0.0455
Cowpea	-1.4676	0.2999	0.1377	**-0.9399**
Hicksian/compensated Elasticity				
Soybean	**0.1388**	-1.3572	-0.0035	-0.0008
Mushroom	-0.1057	**-2.0324**	0.0180	0.0140
Potato	0.0163	1.1512	**-0.6180**	0.1946
Cowpea	-0.0493	2.2384	0.6036	**-0.2077**

Source: Computed from QUAIDS (All quantities are standardized kilogram, and prices are per kilogram).

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Appendix I. Description and a priori expectations of explanatory

VARIABLE	DESCRIPTION	SIGN			REFERENCE
Age	Age of respondent (in years)	+ -			Lloyd *et al.* 2014 Chinda *et al.* 2018
Age^2	The square of the respondent's age (in years)	+			Kaiser *et al.* 2000
Gender	Sex of the respondent (1 if male, 0 otherwise)	+			Obayelu *et al.* 2018
Marital status	Marital status of respondent; Dummy, 1 if married, and 0 otherwise	+			Chinda *et al.* 2018
Educational level	Highest educational attainment of respondent	+			Lloyd *et al.* 2013, Chinda *et al.* 2018
Household size	Household size of the respondent	+			Chinda *et al.* 2018
Income	The income earned per month by the respondent (in naira)	+			Obayelu O.A. *et al.* 2018; Rampal P. 2018
Price	The price at which the food items of interest are purchased (in naira per kg)	-			Rampal 2018; Williamson, and Shah 1981
Expenditure share	The share of expenditure of the respondent for each of the plant-based protein of interest in the study (in naira per week), and given as the total amount spent on individual food item / total amount expended on all plant based protein	+			Rampal 2018; Williamson and Shah, 1981

Appendix II. Summary statistics of variablesvariables

Variable	Definition of variable	Obs	Mean	Std. Dev.	Min	Max
Age	Age of respondents(in years)	343	44.69679	8.950231	20	65
Agesq	The square of age of respondents(in years)	343	2077.676	802.6305	400	4225
Highest_Edu	Highest educational attainment of the respondent (number of years of formal education)	343	19.2828	3.379318	6	23
HHSIZE	Household size of the respondent	343	4.912536	1.536473	1	10
INCOME	Monthly income of respondent (in naira)	343	180635.2	142540.6	10000	800000
QTY_SOYBEA	Quantity of Soybean purchased weekly by the consumer	343	0.215743	0.6341523	0	5
QTY_MUSHROOM	Quantity of Mushroom purchased weekly by the consumer	343	0.065598	0.4774875	0	5
QTY_POTATO	Quantity of potato purchased weekly by the consumer	343	1.268222	1.485627	0	10

Continue Appendix II. Summary statistics of variablesvariables

Variable	Definition of variable	Obs	Mean	Std. Dev.	Min	Max
QTY_COWPEA	Quantity of cowpea purchased weekly by the consumer	343	1.95481	1.707011	0	15
ACT_PRICE_SOYBEAN	Actual price consumer purchases soybean	343	398.7172	50.91518	350	800
ACT_PRICE_MUSHROOM	Actual price consumer purchases mushroom	343	156.7638	27.45586	100	350
ACT_PRICE_POTATO	Actual price consumer purchases potato	343	181.3703	38.01185	100	375
ACT_PRICE_COWPEA	Actual price consumer purchases cowpea	343	408.3382	63.24099	300	600
EXP_SOY	Consumer weekly expenditure on soybean	343	86.73469	251.7706	0	2000
EXP_MUSHROOM	Consumer weekly expenditure on mushroom	343	11.1516	74.97895	0	850
EXP_POTATO	Consumer weekly expenditure on potato	343	221.7201	250.0271	0	1500
EXP_COWPEA	Consumer weekly expenditure on cowpea	343	796.8513	684.9691	0	6000
TEXP_PLANT	Total weekly expenditure of consumer on plant-based protein of interest	343	1116.458	826.0829	150	6000

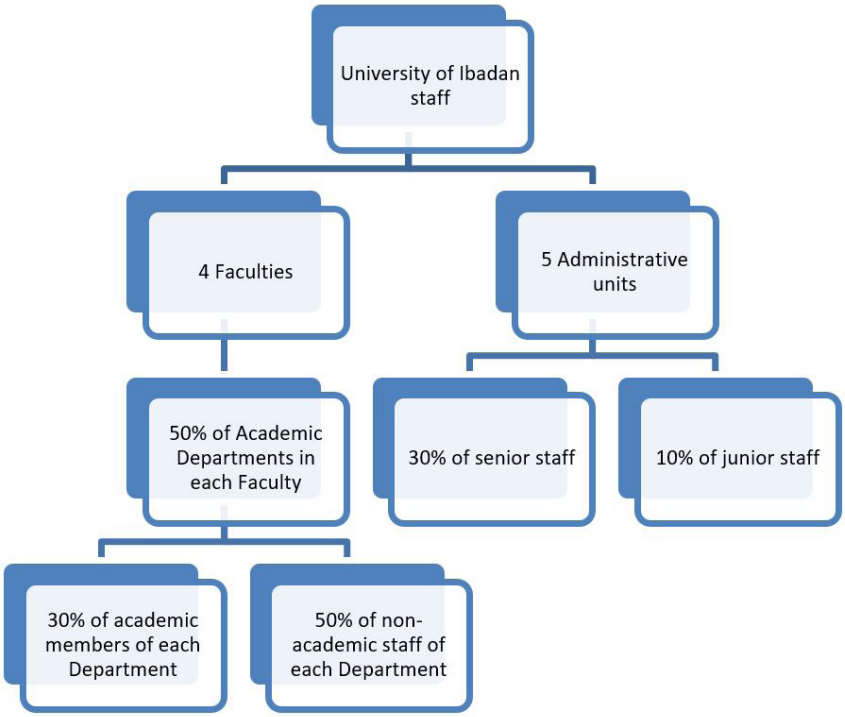

Figure 1. Sampling procedure

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Reasons for consuming *rasi* as a staple food for the Cireundeu indigenous people: a qualitative study

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Data of the article

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Keywords

food culture; food security; sustainable food system; agriculture; staple food; local knowledge; cassava; Cireundeu; Cimahi; Indonesia.

Rasi (made from cassava) is used as a staple food by the Cireundeu indigenous people. This food culture is considered different from Indonesian culture, which uses rice as the staple food. Therefore, this study aimed to show the reasons Cireundeu indigenous people consume *rasi* as their staple food. This qualitative research was conducted in Cireundeu Village, Cimahi City, West Java Province, Indonesia. The data was collected from the Cireundeu indigenous people through in-depth interviews (and participant observation). The data of nutrients in *rasi* were calculated through laboratory tests. The average recommended dietary allowances of Indonesian society (10–80+ years) were obtained through study literature. The notes are analysed by content analysis. The Cireundeu indigenous people consume *rasi* for six reasons: efforts to respect ancestral struggle, to undergo ancestral revelation, to physical and psychological independence, to obtain a source of strength/carbohydrate/energy, to obtain a source of energy-saving and preserve tradition. The reason for consuming *rasi* as staple food comes from within themselves. All of that is supported by the existence of cassava production activities in the Cireundeu Village environment. This food culture can be used as a reference of the importance of the uniqueness of agricultural activities, food culture, and ethnic food in the development of culinary tourism potential, food security, values and socio-cultural life for the society and sustainable intercultural relations (based on local knowledge).

1. Introduction

What is eaten and how to eat something is influenced by religion, traditional knowledge, economy (income) and culture (Atkins & Bowler, 2001; Alonso, 2015; Chang *et al.,* 2018; Diana *et al.,* 2018; Shipman & Durmus, 2017). Jewish and Muslim communities cannot eat pork because it is haram (Atkins & Bowler, 2001). West African residents are accustomed to eating cassava (*Manihot esculenta*) as a staple food (Montagnac *et al.,* 2009). A Madurese pregnant woman may not consume *kedondong*, pineapple, shrimp, squid, instant noodles, cabbage and cold water for herself and her fetus (Diana *et al.,* 2018). The low-income Chinese population chooses sorghum, corn and potatoes, even though corn and sorghum are used as animal feed (Chang *et al.,* 2018). These examples of food choice are the embodiment of food culture.

The food culture is a nonmaterial culture with its authenticity value (Zeng *et al.,* 2014; Mardatillah *et al.,* 2019). Understanding it can be used as a reference in food systems policy and sustainable intercultural relations (Ishak *et al.,* 2019; Chen & Antonelli, 2020; Karaosmanoğlu, 2020). On the other hand, this cannot be separated from regions, staple food productivity, cultural, social systems, and perceptions (Song & Cho, 2017; Yamane *et al.,* 2018; Atungbou, 2020; Masters, 2021). Therefore, in-depth research related to food culture is needed.

Part of the food culture of the Indonesian people is to consume rice (*Oryza sativa*) as a staple food (Panuju *et al.,* 2013; Ahadiyat *et al.,* 2014; Rachmat *et al.,* 2014; Shiotsu *et al.,* 2015; Nurlaili *et al.,* 2016; David *et al.,* 2020), even though its productivity is greatly influenced by climatic conditions (Bantacut, 2014). The average consumption reached 130 kg/person/year in 1993 and 115 kg/person/year in 2012 (Saediman *et al.,* 2016). Consumption was not only realised in the form of cooked rice but also made into *kupat tahu* in West Java Province, *ketupat sumpil* in Central Java Province, *orem-orem* in East Java Province, *tipat* in Bali Province, *ketupat bareh* in West Sumatra Province, and *ketupat kandangan* in South Kalimantan Province (Rianti *et al.,* 2018). In other words, Indonesian people's food patterns are highly dominated by rice because they are spread across various provinces and islands.

Java Island has 56 quintals/hectare rice productivity, whereas Indonesia has 52 quintals/hectare (BPS-Statistics Indonesia, 2019). In other words, Java Island has higher rice productivity than Indonesia's average rice productivity. However, rice is not used as a staple food for the Cireundeu indigenous people who live in Java Island, more precisely in Cireundeu Village, Cimahi City, West Java Province, Indonesia. Therefore, Cireundeu indigenous people are known as indigenous peoples who are unique in terms of food culture.

The food culture of the Cireundeu indigenous people is to consume *rasi* as their staple food, which is made from cassava (*Manihot esculenta*). Therefore, the research aimed to show why the Cireundeu indigenous people consume *rasi* as their staple food.

2. Material and Methods

2.1. Material and key informants

Rasi was used as a topic of discussion. Data were obtained from key informants who consume *rasi* as a staple food, both in the Cireundeu village environment and outside their territory (they depend on rasi). The selection of key informants was determined based on the structure of the Cireundeu indigenous people (*sesepuh, ais pangampih, Panitén, nonoman*, and other Cireundeu indigenous people) (Figure 1) so that the relevant data could be obtained according to their structure. Informed consent was obtained from all key informants. The data were collected through open, in-depth interviews (and participant observation began from 1 October 2018 – 31 March 2019). Data regarding the categories and number of key informants interviewed can be seen from the following Table 1.

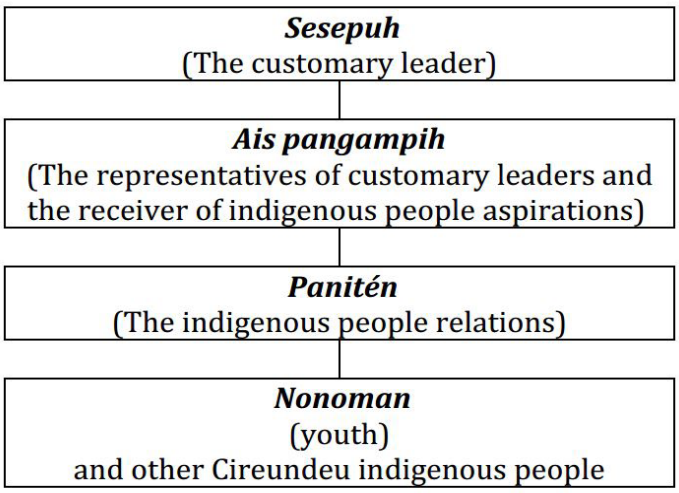

Figure 1. The structure of the Cireundeu indigenous peoples

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Table 1. The key informant's data

No.	The key informants		Name initial (age (years))
	Category	The number of people	
1.	*Sesepuh* (the customary leader)	1	ES_1 (82)
2.	*Ais pangampih* (the representatives of customary leaders and the receiver of indigenous people aspirations)	1	W_1 (57)
3.	*Panitén* (the indigenous people relations)	1	AW (52)
4.	*Nonoman* (youth)	8	SH (12), SS (19), K (21), TS (35), OS (39), S_1 (40), ES_2 (41), Y (42)
5.	Other Cireundeu indigenous people	11	RMK (27), RS (32), NS (38), S_2 (38), E (44), SW (46), M (49), EN (57), C (61), T (66), W_2 (76)
Total		**22**	–

2.2. Data collection

Data collection on the consumption of *rasi* as staple food was done through in-depth interviews (and participant observation). In-depth interviews were conducted in the Sundanese language—one of Indonesia's regional languages, namely in the Provinces of West Java and Banten. Notes of the results of in-depth interviews were translated into English.

The nutritional data for *rasi* were calculated by using the Kjeldahl method (for protein), the direct extraction method (for fat), the Luff Schoorl method (for carbohydrates), the gravimetric method (for fibre and moisture), the spectrophotometric methods (for phosphorus), the atomic absorption spectroscopy (AAS) method (for sodium, magnesium, potassium, calcium, manganese, iron [(2)] and zinc [(3)]) and the calculation method (for calories). The calculation was carried out at the Testing and Calibration Laboratory, Institution of Research and Standardization of Industry – Surabaya, Agency of Research and Development of Industry, Ministry of Industry, Republic of Indonesia. Furthermore, the average recommended dietary allowance values of Indonesian society (10–80+ years) were obtained from Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 tentang Angka Kecukupan Gizi yang dianjurkan untuk Masyarakat Indonesia (Regulation of the Minister of Health of the Republic of Indonesia Number 28 the Year 2019 about Recommended Dietary Allowances that Apply to the Indonesian Society) (Moeloek, 2019).

2.3. Data analysis

The notes were analysed by content analysis. This analysis was used because the sampling was carried out in a detailed and structured manner, and the data was in the form of written answers to open-ended questions (Elo *et al.*, 2014; Diana *et al.*, 2018).

2.4. Study site

This research was conducted in Cireundeu Village, Cimahi City, West Java Province, Indonesia (Figure 2). The geographical location is between 06°54'32" S – 06°55'16" S and 107°31'15" E – 107°31'37" E. The research took place between 1 October 2018 – 31 March 2019.

Figure 2. Cireundeu indigenous people live in Java Island, Cireundeu Village, Cimahi City, West Java Province. Cireundeu Village is southeast of Jakarta, the Capital City of Indonesia and west of Bandung City, the Capital City of West Java Province (Google, 2019).

3. Results

3.1. History of *rasi* in Cireundeu Village

Omoh Asnamah pioneered the consumption of *rasi* as a staple food (Figure 3) in 1924 after she was detained by the Dutch for 100 days at the Banceuy Penitentiary. The idea was a revelation in anticipation of a food crisis (especially the rice crisis) due to the increasing population and increasingly narrow agricultural land.

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Figure 3. *Rasi*, the cassava (*Manihot esculenta*) processed products from Cireundeu Village, Cimahi City, West Java Province, Indonesia. The processing process is done through *nyampeu* (*rasi* processing method which Omoh Asnamah spearheaded since 1924).

During this time, Asnamah introduced *nyampeu*, the *rasi* processing method. *Nyampeu* consists of eleven stages. The stages starting from *ngerik* (scraping), *ngupas* (peeling), *ngabilas* (washing), *marud* (grating), *meres* (wetting, stirring, swinging, pressing and sedimentation), *moé* (sun drying), *nutu* (pounding), *ngayak* (sieving), *nyaian* (moistening), *nyeupankeun* (steaming) and *ngakeul* (cooling and stirring).

Eating *rasi* is an example of a nonmaterial culture from Cireundeu Village, Cimahi City, West Java Province, Indonesia. They carry out the manufacturing process of *rasi* through *nyampeu*. Production is done every month because they plant cassava with different planting periods so that the needs of cassava (as a raw material of rasi) can be fulfilled every month.

3.2. Respect ancestral struggle

The Cireundeu indigenous people's ancestors lived during the Dutch colonial period (19th and 20th centuries). They began to switch food patterns from rice to non-rice in 1918 and made cassava a staple food starting in 1924. The transition impacted weight loss and was a struggle of the ancestors of the Cireundeu indigenous people. The next generation used the ancestral struggle as a reflection to appreciate their hardships with complete self-awareness and without coercion. The Cireundeu indigenous people made three statements,

"The struggle of previous ancestors were so heavy. Ancestors were asked in the period between 1918 and 1924 [6 years of transition from rice to cassava], 'For what do you [Mamah Ali] suffer and fatigue like this [body changes from fat to thin, because it changes patterns food from rice to non-rice for 6 years]?' The question was answered, 'Uh, I love my children and grandchildren (descendants).' I contemplated that answer to mean my ancestors loved me too ... So, what does it mean for the previous ancestors to be like that if I [as their descendants] consume rice? It's like not respecting the struggle of the previous ancestors [who switched food patterns from rice to cassava]" (TS, 35 years old).

"... If my parents eat cassava [as material of rasi] but I don't like them, how?" (SW, 46 years old).

"I imagine the condition of the ancestors who had fought during the Dutch colonialism... If [the culture of eating cassava] was not continued by us, who else would continue it?" (EN, 57 years old).

3.3. Undergo ancestral revelation

The shift in food patterns was used to guide the Cireundeu indigenous people to adjust to the times (population growth and narrowing of rice fields) and not dependence on rice. The Cireundeu indigenous people made four statements,
"There is a prophecy [of ancestors] that rice will run out" (RS, 32 years old).

"Yes, there is an ancestral mandate that I must carry out ... Rice is likely to run out in the future. Running out means rice fields [as a rice-producing land resource]... Land conversion from rice fields to settlements is also unstoppable, resulting in an imbalance between needs and production. The population is increasing, while rice fields are decreasing. Indeed, there will automatically be a shortage of food ... If we focus on rice, it will be like that" (AW, 52 years old).

"Ancestors have the insight to stop from rice. It was made as a guide [for us]. What is the guidance?... In my imagination, the condition of the land for farming [rice] is almost exhausted at this time, even more so in the city, while we eat it every day, at breakfast, lunch and dinner. That is the shadow of insight from previous ancestors applied by their descendants. It turns out, it becomes a guide [for us] not to depend [on rice]" (W1, 57 years old).

"Eating cassava is the result of the revelation of Omoh Asnamah [ancestor of the Cireundeu indigenous people] in 1924. She was detained for 100 days at the Banceuy Penitentiary. The discovery was obtained while she was detained there. Her revelation was that rice would be lacking in the future ... Therefore, the ancestors have stopped eating rice since 1924" (ES1, 82 years old).

3.4. Physical and Psychological Independence

The Cireundeu indigenous people consume *rasi* as an effort to be independent physically and mentally from various issues regarding rice, such as rising rice prices (high rice prices), rice imports from other countries to Indonesia, the problem of white rice, as well as queuing activities in purchasing *raskin* (short for "*beras miskin*" or "rice for the poor" sold cheaply by the government to poor people). Consuming *rasi* gives them pride and independence from the government. The Cireundeu indigenous people made four statements.
"We eat rasi to be free, independent both physically and mentally [not dependent on rice]. We have felt the pleasure of being independent in both body and mind" (TS, 35 years old).

"I imagine that if ancestors did not switch to eating cassava, maybe other residents and I would be in line every time there was a raskin program. That can be equated with a life of dependence on the government. In other words, life is not independent" (S1, 40 years old).

"I have felt the benefits of eating rasi. Other people are busy about the price of rice, while I don't think about rice" (ES2, 41 years old).

"We want independence in both physical and mental aspects. If there is a rise in rice's price, import of rice, or use bleach, uh, we take it easy" (Y, 42 years old).

3.5. Obtain a source of strength/carbohydrate/energy

The Cireundeu indigenous people believe that sources of strength, carbohydrates, and energy do not have to be obtained exclusively through rice. *Rasi* is valued as a source of strength, carbohydrates, and energy for them. The Cireundeu indigenous people made three statements,
"Rasi is a source of strength" (OS, 39 years old).

"The source of carbohydrates is not only rice but there are also others [such as rasi]" (AW, 52 years old).

"Our strength [of the Cireundeu indigenous people] comes from cassava [rasi]" (T, 66 years old).

3.6. Obtain a source of energy–saving

Rasi is not consumed in large quantities to meet energy needs. Less than 1 kg of constituents can be cooked into a *rasi* for eight people in one day. *Rasi* often remains until the next day without expiration. In oth-

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er words, *rasi* is consumed by Cireundeu indigenous people in minimal amounts, resulting in savings in raw materials to meet energy needs. The Cireundeu indigenous people made three statements,
"Rasi is consumed twice a day. It can make the stomach feel full. Rasi is consumed in small amounts" (OS, 39 years old).

"Cooking rasi is not more than one kg since the last time. It is cooked for eight people in one day. Even the rest is often left until the next day [without expiration]. Indeed, more efficient. Very economical" (S1, 40 years old).

"[Raw material of rasi] is of little use" (ES2, 41 years old).

3.7. Preserve tradition

The consumption of *rasi* as a staple food has become a tradition for the Cireundeu indigenous people. This tradition was taught and imitated to them from their childhood. The main characters are the mother, father, grandmother and grandfather. This tradition is also carried out as a form of self-awareness to preserve the culture of eating *rasi* and maintain the ethics of eating in an indigenous environment with joy, peace, comfort and without coercion. The Cireundeu indigenous people made thirteen statements.
"[Eating rasi] has become a [tradition] for generations" (SH, 12 years old).

"[I] have been given rasi since my childhood. Mother, father and grandmother consume cassava" (SS, 19 years old).

"This [culture of eating rasi] is self-awareness to continue customs" (K, 21 years old).

"I followed the direction of mother and father. This [culture of eating rasi] is a tradition. There's no way I'm different [from them]" (RMK, 27 years old).

"I was introduced to [rasi] since childhood by mother, father and grandmother" (RS, 32 years old).

"This [culture of eating rasi] has been done since childhood (from the age of zero months). It has become a tradition for generations" (S2, 38 years old).

"This [culture of eating rasi] has become a tradition and custom for generations. If I don't, who will do it? If it stops (no one continues), then it will no longer be exist" (NS, 38 years old).

"This has been a tradition for generations. I am used to [eating rasi]" (E, 44 years old).

"My mother consumed cassava from childhood until her death. So, I also consume cassava [rasi]" (M, 49 years old).

"I do not consume rice not because I cannot, but I live in a customary environment [which consumes rasi as staple food]. Ethics must be maintained. Do I have to eat certain foods carelessly? Of course, I cannot do that" (W1, 57 years old).

"I have been used to [eating rasi] since my childhood" (C, 61 years old).

"[I eat rasi] to carry on the traditions of grandfather and ancestors" (T, 66 years old).

"[I eat rasi] because I am a descendant of my father [who consumes rasi]" (W2, 76 years old).

4. Discussion

The Cireundeu indigenous people maintained their diet transition from rice to cassava as a direct connection to their ancestary. Further, they understood the transitioning food culture with deep respect and self-empowerment. This culture has complemented the results of previous studies: food culture is not only influenced by religion, traditional knowledge, economy (income) or culture (Atkins & Bowler, 2001; Alonso, 2015; Shipman & Durmus, 2017; Chang *et al.,* 2018; Diana *et al.,* 2018), but also is influenced by historical factors.

The ancestors of the Cireundeu indigenous people projected that rice would experience shortages in the future. A rice shortage can occur due to decreased agricultural land (especially rice) in line with population growth, exacerbating hunger when rice is consumed as part of each meal. However, the culture of eating *rasi* has made the Cireundeu indigenous people adjust to the times (population growth and narrowing of

rice fields) and not depend on rice. This fact is considered an anticipation step on the population's principle from Thomas Robert Malthus: "population, when unchecked, increase in a geometrical ratio. Subsistence (food production) only in an arithmetical ratio" (Rutherford, 2007; Malthus, 2011; Brooke, 2020).

Anxiety about the issue of rice was also not experienced by the Cireundeu indigenous people. They are people who enjoy independence from the physical and psychological issues attached to rice. They do not experience anxiety when they hear news about the rice price, rice import, and the problem of white rice. They do not need to queue to buy *raskin* because they do not consume rice as a staple food. This makes them feel proud because consuming *rasi* plays an essential role in giving them a sense of independence. More so, they can live without government dependency. This fact shows the impact of traditional knowledge on food culture like previous research (Atkins & Bowler, 2001; Alonso, 2015; Shipman & Durmus, 2017; Chang *et al.,* 2018; Diana *et al.,* 2018).

The Cireundeu indigenous people also have thought that energy needs do not always have to be obtained from rice. *Rasi* provides up to 1341.2 kcal/kg, and consuming 1 kg of *rasi* does not exceed the average of recommended dietary allowances (RDA) for the people of Indonesia of 2100 kcal/person/day (Moeloek, 2019). Thus, *rasi* is safe for consumption for people with diabetes due to its low caloric value and because cases of diabetes are not found in the Cireundeu indigenous people.

Based on Table 2, if *rasi* is consumed as much as 1 kg/person/day, the recommended dietary allowances of carbohydrates, sodium, and magnesium are fulfilled. At the same time, however, the recommended dietary allowances of protein, fat, fibre, water, phosphorus, potassium, calcium, manganese, iron, and zinc is not met. To mitigate this problem, the Cireundeu indigenous people consume carrot, chicken, chilli

Figure 4. Examples of various sources of nutrition consumed by the Cireundeu indigenous people.

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Table 2. Cireundeu indigenous peoples' recommended dietary allowances fulfillment

No.	Food nutrition	Average recommended dietary allowances of Indonesian society (10–80+ years) [a]	Nutrition in *rasi* [b]	Note
1.	Protein (g)	62	6.10	Not fulfilled
2.	Fat (g)	62	3.30	Not fulfilled
3.	Carbohydrates (g)	315	321.80	Fulfilled
4.	Fiber (g)	29	19.90	Not fulfilled
5.	Water (ml)	2078	381.90	Not fulfilled
6.	Phosphorus (mg)	906	30.00	Not fulfilled
7.	Sodium (mg)	1375	1900.00	Fulfilled
8.	Magnesium (mg)	294	710.00	Fulfilled
9.	Potassium (mg)	4700	600.00	Not fulfilled
10.	Calcium (mg)	1150	800.00	Not fulfilled
11.	Manganese (mg)	2	< 0.0234	Not fulfilled
12.	Iron(2) (mg)	11	0.62	Not fulfilled
13.	Zinc(3) (mg)	9	1.49	Not fulfilled
[a] Moeloek (2019); [b] = Analysis results				

sauce, corn, prawn crackers, snaps and tofu (Figure 4), including egg, tempeh and various types of vegetables and fruits to meet their nutritional needs. For as long as the research was conducted, not a single indigenous Cireundeu person experienced malnutrition. While three individuals were taken to a hospital, they suffered from dengue fever caused by dengue virus through the principal mosquito vector, *Aedes aegypti* (Amelia-Yap *et al.,* 2018; Kamal *et al.,* 2018; Marques-Toledo *et al.,* 2019; Powell *et al.,* 2018) and not a nutrition deficiency.

This study also found that making *rasi* did not require many essential ingredients. Eight people can consume 1 kg of it in one day. Leftovers often remain until the next day without expiration. *Rasi* also provides a sense of fullness that allows the Cireundeu indigenous people to consume it sparingly. This is not in line with Chang et al. (2018) and Alonso's (2015) research, which states that economic factors influence food selection: the higher the income, the wider the food affordability.

The last and foremost reason that the Cireundeu indigenous people consume *rasi* as a staple food is that consuming a *rasi* has become a tradition. This tradition is preserved based on self-awareness and the importance of maintaining ethical eating in an indigenous environment. This awareness arises because of the enculturation of eating *rasi* passed down from parents and grandparents to the following generations. This finding aligns with previous research, which states that cultural factors (especially tradition) also influence what and how something is eaten (Atkins & Bowler, 2001; Alonso, 2015; Shipman & Durmus, 2017; Diana *et al.,* 2018).

All of that is supported by the existence of cassava production activities in the Cireundeu Village environment. Cassava is obtained from production in the Cireundeu Village environment itself, agriculture, and processing. The farmers have just harvested cassava in leuweung baladahan (Figure 5), an area of land used for cassava agricultural activities (primary) and various other consumption crops. Cassava seeds are not planted simultaneously in *leuweung baladahan*. Thus, there is no term for cassava harvest season in *leuweung baladahan*.

Rasi production is done every month as cassava is planted during different planting periods in *leuweung baladahan*. The needs of cassava as a constituent base can be met every month. The processing is directly carried out after cassava harvest. The processing

is done through the process of *nyampeu*. The result (raw *rasi*) can be stored for months in a clean and dry place. This aligns with previous research, which states that climate does not significantly affect cassava productivity (Bantacut, 2014) and that staple food choice is influenced by local production and people's livelihoods (Alonso, 2015; Chang *et al.,* 2018).

However, the life of the Cireundeu indigenous people cannot be categorised as isolated social life because the Cireundeu indigenous people constantly carry out social interactions with other outside communities. The interaction is carried out through the socialisation of food security education to tourists to the Cireundeu Village environment (Figure 6). Part of the education material included the reasons for consuming *rasi* as a staple food in the region. *Rasi* is also consumed by tourists who visit there. Thus, edu tourism can be developed in the Cireundeu Village environment due to the uniqueness of agricultural activities, food culture, and local food that the Cireundeu indigenous people have realised. This fact can be used as a reference of the importance of the uniqueness of agricultural activities, food culture and ethnic food in development culinary tourism potential, food security, values and socio-cultural life for the society and intercultural relations in a sustainable (Chairy & Syahrivar, 2019; Rachão *et al.,* 2019; Wijaya, 2019; Wibisono *et al.,* 2020; Karaosmanoğlu, 2020; Camanzi & Troiano, 2021; Dehrashid *et al.,* 2021; Kidane & Kejela, 2021).

5. Conclusions

The reason for consuming *rasi* as staple food comes from within the Cireundeu indigenous people itself. *Rasi* is consumed for six reasons: efforts to respect ancestral struggle, undergo ancestral revelation, physical and psychological independence, as a source of strength, carbohydrate, and energy, energy-saving, and preserve tradition. The effort to preserve traditions is considered the most common reason to consume *rasi* as a staple food. All of that is supported by cassava production activities in the Cireundeu Village environment (*leuweung baladahan*), Cireundeu Village, Cimahi City, West Java Province, Indonesia. Besides that, this food culture can be used to reference the importance of the uniqueness of agricultural activities, food culture, and ethnic food in the devel-

Figure 5. Cassava farming activities carried out by Cireundeu indigenous people in *leuweung baladahan*, Cireundeu Village, Cimahi City, West Java Province, Indonesia. *Leuweung baladahan* is land used for cassava agricultural activities (primary) and various other consumption crops.

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Figure 6. Food security education to tourists in the Cireundeu Village environment.

opment of culinary tourism potential, food security, values and socio-cultural life for the society and intercultural relations in a sustainable. The government can develop a national food security education curriculum based on local knowledge.

Since this study's limitation is that there is no test for vitamins in *rasi*, further research suggests that testing *rasi's* micronutrients is necessary. If this has been done, the publication is needed to add to the value in local knowledge-based food security research, especially for the Cireundeu indigenous people. The hope is that the government can support sustainable and contextual national food security based on local knowledge.

Conflict of interests

The authors declare no conflict of interest. The funders had no role: in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Continuity and changes in food consumption pattern among Tibetan refugee community in India

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Dietary intake, Food insecurity, Nutrition, Health, Food Continuity

The Food consumption pattern of refugee communities is being carried out by many scholars and few acknowledged the food continuity, its implications on the health of refugees in the host country. The present study highlights food continuity among Tibetan refugees in the Bylakuppe settlement, India. 200 household data were administered to understand food consumption patterns by employing a structured household questionnaire. Simultaneously, 23 individual data were collected consisting of first migrants (15) and second-generation (8) for the qualitative study. Households derive energy mainly from carbohydrates and animal fats, and there is a prevalence of food insecurity among the Tibetan community. It is a proven fact that food insecurity will have serious health consequences in terms of emotional and mental well-being and suggest the need for further study of food insecurity among Tibetan refugees across the world.

1. Introduction

Types of food and its consumption pattern have implications on food and nutrition security. Nutrition refers to everything that we eat and drink, which includes carbohydrates, proteins, fats, vitamins, and minerals in the right amount that give nutrients to stay healthy. Food insecurity is prevalent across the globe, especially among vulnerable communities such as asylum seekers and refugees (Henjum et al., 2019). Refugee experience trauma, food insecurity, interrupted education, and social upheaval (Peterman et al., 2011). While nutrition studies have identified implications of food and nutrition insecurity on various physical and mental health-related issues, very little is known on changes in food consumption behavior among the refugee communities and its possible implications on health from a social scientist perspective (Pelto & Freake, 2003). Refugees, unlike local inhabitants, have to adapt to the available food in new places while struggling to access food at the same time. Therefore, it is interesting to understand the changing pattern of food habits. These changes have implications on nutritional balance leading to various health implications.

1.1 Food consumption pattern in Asian countries

Food consumption patterns and nutritional status of women laborers from Coastal areas of Karnataka

were investigated. 120 women were interviewed using standardized interview schedules drawing information on their demography, food purchasing pattern, and frequency of consuming different foods. Anthropometric measurements such as Weight, height, Mid-upper arm circumference (MUAC),and Waist-hip ratio (WHR) were recorded using standard procedures and equipment. Comparisons were made between daily wage earner and monthly earner and diet type in terms of receiving proper nutrition. It was interesting to find that both types of payment and diet type affect the nutritional status of women while daily wage earner (68.5%) and the monthly payment (72%) had BMI of the normal range. The prevalence of obesity was less among both the group but 84% of all the women who participated in the study had central obesity (Archana & Khyrunnisa, 2012). WHO stepwise questionnaire was used to obtain information on demographic and socio-economic characteristics as well as food consumption patterns of the adult population in rural and urban areas in Faizabad, Uttar Pradesh, India. The main objective of the study was to collect data to understand food consumption patterns and their implication on nutritional deficiencies and non-communicable diseases (NCDs).

A cross- sectional survey with a total of 400 respondents was selected for the study age above 18 years using simple random sampling. The study concluded that the rural population consumes low- cost, easily available, and staple foods while less healthy foods such as fast food, pastries, sweets, chocolates, and soft drinks were frequently consumed by the urban population (Pandey;Neerubala, 2016). This clearly shows that efforts should be made on nutrition education strengthening the positive trends and combating negative ones improving dietary intakes, lifestyle, and nutritional status of the population. Data on consumption pattern, method of food procurement, and adequacy of dietary intake of Burmese refugees in Thailand were analyzed. A total of 182 households (1159 members) were surveyed.

Food consumed was weighed and measured using a 24-hour recall for the household unit and the status of nutrition was analyzed using microtoise tape and digital standing scales. The data revealed that household derives energy from carbohydrate (84%), Protein (9%) and fat (7%). Protein intakes were derived from animal sources (12%) and iron intakes were derived from rice, fermented fish, mung beans, green leafy vegetables, and eggs. The intake of vitamin A, B, B2, C, and Calcium ranged from 24.2% to 53% of RDA. 60.5 to 98.18 of all nutrients consumed in the households come from ration supplied by the Burmese Border Consortium. However, it was not sufficient to meet the daily nutrition requirement. They are unable to purchase additional food due to low income (Banjong et al., 2003). The Food consumption patterns of adolescents aged 14-16 years in Kolkata, India were examined. A self-administered, semi-quantitative, 59 items meal-based food frequency questionnaire was used to assess the dietary intake of adolescents over the previous day. A total of 1026 students attending private schools in Kolkata were selected. The result indicated that students consume only 30% of vegetables and the remaining 70% engage in eating energy-dense snacks and aerated drinks. At the same time, it was found that girls tend to eat more nutritious food than boys (Rathi et al., 2017). The relationship between socioeconomic variables like the size of the households and total income to consumption pattern of food items such as protein, fats, sugar, eatable oils, etc. A sample size of 375 household data was collected randomly through a structured questionnaire. Statistical and econometric techniques were used to analyze the data using the ordinary least square method.

The data revealed that household monthly income and household size had a positive correlation on food items i.e wheat flour, milk, vegetables, tea, and fruits. The study stressed that with the growing population, more research should be encouraged on the food consumption pattern of households as it directly affects health and without proper nutrition and health, a nation cannot grow (Begum et al., 2010).

1.2 Tibetan refugees in India

There is a dearth of research on the food and nutrition of Tibetan refugees in India. Tibetans are faced with serious health issues due to migration and changing food habits in the host country. A study was conducted from April 2017 to March 2018 on 5391 schoolchildren and 786 staff in 11 Tibetan schools to detect tuberculosis using radiography, molecular diagnostics, tuberculin skin testing. The result indicated that there is a high prevalence of tuberculosis among Tibetan school children and suggested a need for strong leadership and community mobilization to control

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TB effectively (Dorjee et al., 2019). India is developing country cannot provide refugees with benefits equivalent to developed countries. Therefore, Tibetans living in India have poor health as they cannot afford health facilities. The health perception and health behavior of elderly Tibetans living in India and Switzerland were analyzed. It was found that Tibetan elders living in Switzerland enjoy better health than those living in India due to the availability of old- age benefits, pensions, and health insurance. Also, they have better access to health care facilities (Wangmo, 2011).

Changes in dietary habits also lead to high consumption of energy- dense food and switching from whole grains and pulses to more refined food resulting in a low intake of fiber- rich food. The effect of changes in diet contributes to various health issues such as cardiovascular disease, obesity, and type 2 diabetes (Ottesen & Wandel, 2012). A comparative study of two Himalayan communities in Nepal revealed that Tibetan women are better off in terms of nutrition status compared to Nepali women. However, the study also manifested the prevalence of malnutrition among Tibetan women (Madjdian & Bras, 2016).

A study concluded that there high health risk for Tibetan women living in lower altitudes than higher altitudes due to decreased physical activity. Tripathy, et al., 2006 study analyzed the nutritional status and hypertension among Tibetan refugees in Bylakuppe, Chandragiri, and Choglamsar settlements in India. The findings revealed that out of the total sample, 4.8 are underweight, 55.6 are normal, 27.9 are overweight and 11.7 are obese. Also, Tibetan women tend to have a higher BMI than men.

1.3 Research gaps

It is clear from the above study that there is a presence of serious illnesses (chronic /long term /short term) among Tibetan refugee communities in India. This could be due to poor eating habits. Also, findings from an Asian study revealed that most of the Asian population consumes energy- dense food and neglects healthy food such as vegetables and fruits. Although food banks provide food to the vulnerable population, however, it lacks proper nutrition to have a healthy body. India stands at 94th rank out of 107 countries in 2020 (Global Hunger Index, 2020). One refugee community that of Tibetan refugees has been residing in India since 1959 after the Chinese occupation. Therefore, this study looks into the shift in food habits using the food security framework (Availability, Accessibility, Utilization, and Sustainability) of High-Level Panel of Expert (HLPE, 2020), a much-neglected area of research on the Tibetan refugee community. Questions on challenges obtaining nutritious and culturally satisfying food by first migrants (those who are born in Tibet) are an important area to explore (Moffat et al., 2017). The food consumption pattern of first migrants and the younger generation (those who are born in India) may throw some light in terms of understanding the food continuity in the host country. Tibetan refugees in India face challenges in terms of procuring a quality health care system; there is a need to educate the Tibetan community about healthy eating habits. Thus, the main objective of the study is to understand food consumption patterns and dietary changes among Tibetan refugees in India. Previous research studies used country- level data but this study used cross-sectional data.

2. Materials and Methods

The study is a mix of quantitative and qualitative approach and the study area is the Bylakuppe settlement in the district of Mysore in Karnataka State, South India, which has the maximum population of refugees. Bera (2004) study found that Tibetans living in low altitude has more health risk compared to high altitude. Therefore, the Bylakuppe settlement in the Mysore district of the state of Karnataka, South India having a maximum population which comes under low altitude was selected for the present study. A total sample of 200 households was collected from both the old and new camps. 60 % of the data was collected from old camp as old camp households are more afflicted with diseases (Planning Commission, 2010).

Therefore, a total of 120 household data was collected from the old camp and 80 household data from the new camp. Researcher along with local community persons administered a structured questionnaire to 200 households. The questionnaire consists of demographic profile and food consumption frequency. The data was filled in by the interviewer as the majority of the sampled population was either illiterate or hesitant in filling the form. For the qualitative data collection, the researcher interviewed fifteen households from first migrants (aged above 75 who have food habits of

Tibet) and eight younger generations (Tibetan youth below 40 years of age) during the same course of the quantitative data collection period. Four dimensions of food security were based as a theme for collecting information concerning to food availability, accessibility, utilization, and sustainability.

3. Results

The study focuses on analyzing the food consumption pattern of Tibetan refugees in the Bylakuppe settlement. At the same time, an attempt has been made to understand the food insecurities of Tibetan refugees and their implication on health. The food consumption patterns are presented in the form of descriptive statistics due to their explorative nature. For qualitative, four dimensions of food security were used. The results are in the form of narratives and stories shared by the early Tibetan migrants and the younger generations.

Table 1. Socio-economic profile of the repondent households

Socio-economic profile	Categories	Frequency	Percentage
Age of the respondent	30	5	2.5
	31-40	24	12
	41-50	44	22
	51-60	38	19
	61-70	41	20.5
	71& above	48	24
	Total	200	100
Gender	Male	66	33
	Female	134	67
	Total	200	100
Marital Status	Married	120	60
	Unmarried	15	7.5
	Divorced	3	1.5
	Separated	61	30.5
	Widower	1	.5
	Total	200	100
Educational Qualification	Below Primary	90	45
	Primary	71	35
	Higher Secondary	22	11
	Graduate	17	9
	Total	200	100
Occupation	Farming	40	20
	Business	13	6
	Government	4	2
	Not working	144	72
	Total	200	100
Monthly Income	<10000	4	2.0
	10001-20000	8	4.0
	20001-30000	35	17.5
	30001-40000	22	11.0
	40001-50000	63	31.5
	50001&above	68	34.0
	Total	200	100.0
Monthly Food Expenditure	<5000	39	19.5
	5001-10000	124	62.0
	10001-15000	33	16.5
	15001-20000	4	2.0
	Total	200	100.0

Source: Primary Data

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3.1 Socio-demographic profile of the respondent households

The age of the respondent shows a majority in the old age category since households consist mainly of older generation people due to mass migration towards the west. Almost 70% of sampled population is female which was done purposefully due to their major role in cooking. The majority of the sample respondents are married but there is a high percentage of separated marital status as they have fled Tibet to seek refuge in India. 90% of the respondents are below higher secondary school level and 72% show not working due to old age category. 70% of the respondents have a monthly income above Rs. 30000 and 80% spend above Rs.10000.

3.2 Type of Diet

The following table shows the type of diet followed by Tibetan refugees in Bylakuppe.

The type of diet followed by households manifested that 97.5% of the respondents are non-vegetarian and 2.5% belong to pure vegetarian. This shows Tibetans still maintained food habits of Tibet consuming non-veg at a high rate. 96% of the households use refined cooking oil and only a few households consume other types of cooking oil which is considered healthy such as olive and mustard oil.

3.3 Major diseases afflicted by Tibetans in Bylakuppe settlement

The study examines various types of diseases prevalent in Bylakuppe settlement

Young Tibetans are faced with poor vision as 50% of the household members have some or other problems related to vision. 45% reported high blood pressure in the household. It was also found that arthritis is the second most affected disease in Tibetan households. It was found that children often encounter headaches, poor vision, and anxiety.

3.4 Consumption pattern of Tibetan refugees in Bylakuppe settlement

It is imperative to understand the daily consumption pattern of Tibetan refugees to understand food- frequency.

Tibetans follow a diet rich in carbohydrates daily such as rice and wheat, consuming a less protein-rich diet from fish and meat. Sugar consumption is high in terms of quantity, an average of 5 kgs per month and people consume fewer fruits daily. Many households never eat dry fruits due to their high price. The Indian government provides monthly subsidized food items through the public distribution system. However, the majority belong to the above poverty line (APL) and can avail only rice, which indirectly promotes carbohydrates. 88 % of the respondent households have a ration card. Out of which, 74 % are above the poverty line and 14 % are below the poverty line. The State government provides only rice for above poverty line

Table 2. Type of diet

Type of Food	Category	Frequency	Percentage
	Veg	5	2.5
	Non-veg	195	97.5
	Total	200	100
Cooking Oil	Refined	192	96
	Ordinary	2	1.0
	Others	6	3.0
	Total	200	100

Source: Primary Data

Table 3. Type of disease

Poor Vision	Yes	101	50.5
	No	99	49.5
	Total	200	100
Arthritis	Yes	20	10
	No	180	90
	Total	200	100
High Blood Pressure	Yes	90	45
	No	110	55
	Total	200	100
Tooth Decay	Yes	5	2.5
	No	195	97.5
	Total	200	100

Source: Primary Data

households whereas below poverty line households are provided with rice, dal, and ragi. Around 12 % do not have ration cards either due to illiteracy or uninterest.

3.5 Association between income and food expenditure.

As per previous research, there is a direct relationship between household income and food expenditure meaning increasing income leads to increased food expenditure and vice-versa. Therefore, chi-square was employed to examine the relationship.

The result shows a positive relationship between income and monthly household expenditure and is significant at the 10 percent level. As household income increases, household expenditure tends to increase and vice-versa.

3.6 Qualitative Interpretation

Interviews from twenty-three individuals (fifteen first migrants and eight second-generation) were coded and categorized by theme into one of the four food security pillars (availability, accessibility, food use, and stability) to find the changing diet pattern and its implication for the Tibetan community.

3.7 Food availability

3.7.1 First generation

All the fifteen participants shared their personal experiences from the beginning of their journey and lifestyle in Tibet and their current status in exile. Participants were asked about their dietary intake while they were in Tibet. All the participants gave similar responses as Tsampa (made of mostly wheat) being the staple food in Tibet followed by Curd, Chura (paneer), Meat (Yaksha, Drisha, Lamb), Tibetan tea (made of milk, butter, and salt), Potato, Raddish, Thukpa (noodles), Nyungma (wild plants), Butter, etc. Wealthier families consumed Mutton and various kinds of pulses on a daily basis while rice consumption is less. The result indicated that all 15 participants show a change in their food consumption pattern. They all have faced hardship in terms of life-threatening journeys experiencing trauma, fear of Chinese persecution, and thirst on their way towards India. Despite these challenges, they have to deal with food insecurity in the host country. They could avail only beef in India due to various socio-economic reasons. Few of them mentioned its unusual taste and slowly adjusted to the taste due to lack of food preferences. They developed poor digestion in the process and were prescribed medication on other occasions. Almost all the participants reported that the quality and freshness available in the camp were not as good as those in Tibet.

"Whatever food I wish to cook, materials are not available in the nearby market." (Participant 3)

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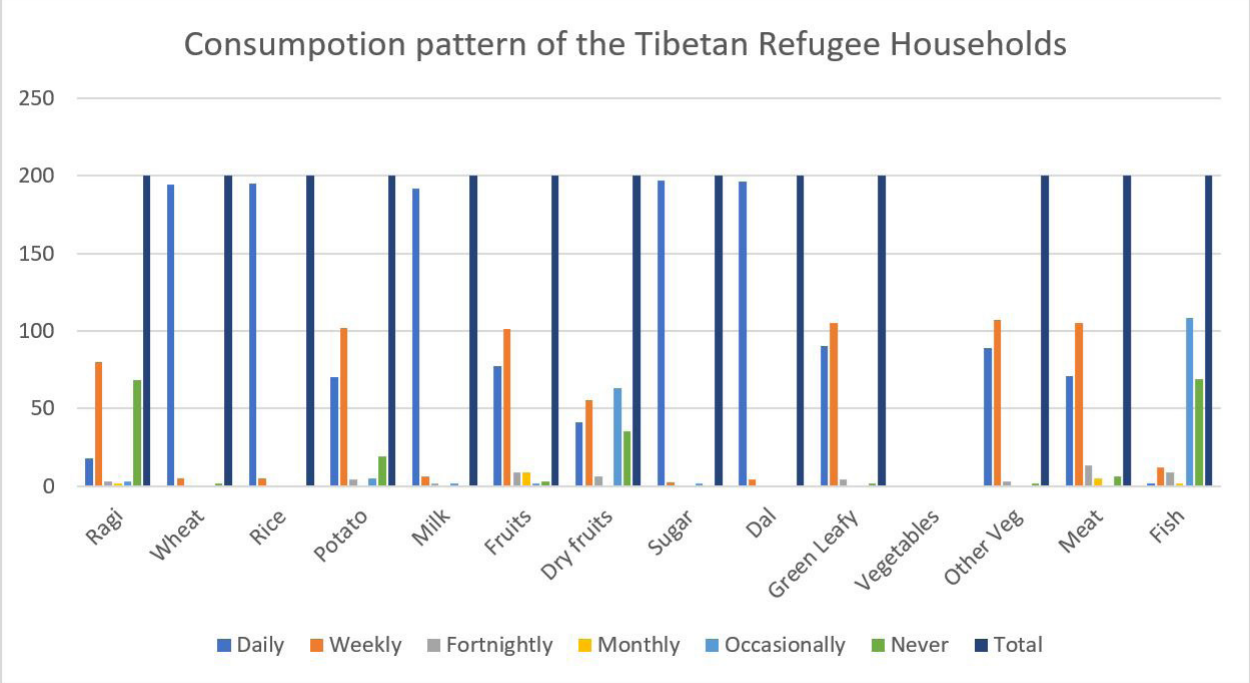

Figure 1. Consumption pattern of the Tibetan households in Bylakuppe settlement. (Source: Primary Data)

Table 4. Relationship between income and household expenditure (Rupees (Rs))

Monthly Income	Expenditure				
	<5000	5001-10000	10001-15000	15001-20000	Total
<10000	1	3	0	0	4
10001-20000	3	4	1	0	8
20001-30000	9	21	5	0	35
30001-40000	3	14	5	0	22
40001-50000	12	43	7	1	63
50001&above	11	39	15	3	68
Total	39	124	33	4	200

Source: Primary Data

3.7.2 Second generation

Eight participants from second- generation (between 26-39 ages) expressed a lack of availability of their food choices. They are mostly graduates from various Indian Universities and adapted to city food culture, mostly junk and fast food. The profiles of respondents include teachers in the Tibetan settlements or home-makers. They shared the taste of food they used to enjoy in the Indian cities.

One participant said, *"I miss fish, prawn, sausages, and bacon that I used to consume when I was in Bangalore city. In the settlement, I rarely get to consume all these". (Participant 1)*

Another participant said, *"I miss KFC and Pizzas of Bangalore city". (participant 2)*

A participant from Dharamsala, in North India, mentioned, *"I miss south Indian food such as chicken, fish, biryani. Although we get here, the taste differs".*

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From the above, it is clear that the Tibetan second-generation does have the problem of attaining food of their choices due to availability issues in the Tibetan settlements.

3.8 Food accessibility

3.8.1 First generation

Two major factors hinder Tibetan refugee households in terms of accessing food. The first reason is due to a lack of steady income. Secondly, the experience and trauma they had in terms of hunger during their early settlement preventing them from buying quality and nutritious food because of the poor eating habits they have developed. Although the purchasing power has improved due to remittance flow from abroad, they are unsure of perpetual remittance flow.

One participant explained the frequency of remittances. *"Till now I am receiving remittances from my son and daughter every month. However, I am unsure if they will send money regularly". (Participant 15)*

Unemployment is another challenge in the Tibetan community. Thousands of Tibetan youth graduate from Indian Universities, yet they are unable to get a decent job. There is also a lack of job creation in the Tibetan community. This often leads to the state of shock to feed the young members in the households; increasing inflation adds to the agony. It is observed that all the respondents have food insecurity and live-in fear of being hungry again. A few of them rely on the public distribution system for monthly ration availing mostly rice and sugar. They have acquired ration cards of below the poverty and above the poverty line from the Indian government. They are reluctant to avail the facilities due to the quality of food they receive from the public distribution system. A few of them do not utilize the facilities due to local language barriers especially new arrivals from Tibet face difficulty communicating with local Indians. The illiteracy among the household members who cannot read food labels leads to the exploitation by shop owners selling expired products.

3.8.2 Second generation

Accessibility, according to second-generation has mixed responses. Those who have a permanent job have never faced food accessibility issues, and those without a stable job and unemployed do have problems in procuring food of their choices. They have to compromise something to acquire something else.

A participant of 26 years of age said, *"I have to give up buying clothes to suffice my food requirements". (Participant 3)*

Seasonal fluctuation does have an impact on household food purchasing behavior on certain items.

A participant said, *"Last time when onion price rose to Rs 120 per kg, we do not consume onion and purchase more of tomato instead". (participant 5)*

A similar response *"I buy less of onion due to its high price and minimize its usage in daily food". (participant 8)*

3.9 Food utilization

3.9.1 First generation

Older generation people have shown indifference to the problem of food insecurity. However, they expressed the insufficiency of quality food and compromise their choices and adapt to the local diet. This may affect their mental health in the long run as eating traditional food is linked to sound health, which was found by Brown et al. (2010) that it is an antidote to reduce stress and loneliness and plays a role as a symbol of home. They all shared the positive changes in the settlement regarding access to clean water, sanitation, and hygiene for cooking the food in the households.

3.9.2 Second generation

All the second generations responded to clean water, sanitation, and a hygienic place to cook food to acquire healthy life.

3.10 Sustainability

3.10.1 First generation

With the increasing emigration towards western and

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European countries, the standard of living has improved, leading to higher purchasing power within the households. Older people do not have problems in acquiring food regularly but are food insecure because of unstable income or fear of remittance delay.

3.10.2 Second generation

The majority of the respondents do not have food insecurity as most of them belong to an employed category.

"I do not worry about food insecurity as I have a steady income and saved enough for future use". (participant 1,2,4,5,6,7 & 8).

"My husband is in the army, and food insecurity is out of the question". (participant 5)

4. Discussion

This study concludes that first- generation Tibetan refugees used to consume a protein-rich diet in Tibet. However, a close examination of current food habits reveals that the food consumption pattern has changed drastically towards more carbohydrates as suggested in primary data. Also, sugar consumption is high, along with artificially sweetened beverages by household members. As per Koning et al. (2011) study, sugar-sweetened beverage consumption is strongly associated with type 2 diabetes. The study revealed that households tends to spend more on food expenditure of their monthly income towards dense energy food rather than on quality food. The majority of the sample respondents were old age who reside in settlements looking after their grandchildren. They are not in a position to prepare food and opt for alternative purchasing food from nearby restaurants. Also, income plays a vital role in the food consumption pattern, which is in line with other studies. The qualitative analysis supports the results that Tibetan youth who are working and having stable income have an opportunity for saving and they are food secured.

Thus, there is a need for creating job opportunities in the settlement for encouraging the sustainability of Tibetan youth. Also, the lack of food choices may lead to youngsters opting for urban cities or migrating abroad, which is currently one of the main issues in the Tibetan community. A field study reveals that there is an increasing number of diseases such as high blood pressure, child obesity, and impaired vision among the young generation. It is evident that the eating habits and lifestyles of older generation people are strongly influenced by past cultural associations (having meat as staple food). In contrast, the young generation prefers fat-rich purchased food. Therefore, various NGOS's and the Tibetan government should be focusing on in-depth analysis of the possible link between food continuity leading to nutritional deficiency and its implications on overall health.
Practical implication

This is the first study exploring the food continuity of Tibetan refugees in India. Previous studies highlight the changing food consumption pattern leading to long-term negative health impacts. This study highlighted the discontinuity of traditional food by Tibetan refugees in India. Lack of food choices, rising child obesity, and unhealthy eating habit may lead to serious health consequences. Hence, there is a strong need for policy interventions from NGOs and Central Tibetan Administration (CTA) by promoting awareness on nutrition and prevent further degradation of Tibetan refugee health.

Theoretical implication

The study is in line with the literature that migration has induced changes in dietary patterns and food insecurity among refugees.

Limitation and future recommendation

The study has covered only Tibetan refugees in South India due to time and resource constraints. Future researchers can take into consideration of other zones to have a clear picture of this refugee group. Also, in-depth research is required in terms of understanding food security. A qualitative approach is recommended rather than quantitative to draw further insight.

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Conflicts of interest

The authors declare that there is no conflict of interest related to this manuscript.

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Research Paper

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Finding alternatives: Canadian attitudes towards novel foods in support of sustainable agriculture

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sustainable agriculture; consumer behaviour; novel foods; alternative proteins

Global agriculture and farming practices account for roughly a quarter of total atmospheric emissions. Protein agriculture is especially prone to greenhouse gas emissions. There is a need to find alternatives for protein forms and sustainable practices in providing alternative protein sources. However, sustainable agricultural practices must consider consumer behaviour and attitude towards switching protein sources. In this quantitative study, a survey of 993 Canadians was carried out to better understand the likelihood of adoption of alternative proteins, cultured meat, insects and jellyfish; attitudes towards sustainable agriculture were also explored. Results show that novel foods that imitate traditional protein sources have a higher acceptance rate than those not part of the cultural food landscape. There is no evidence that consumers would switch from traditional protein sources when given more protein source options, calling into question the environmental efficacy of novel food offerings. This suggests that investment in alternative proteins as sustainable agriculture requires consumer engagement to see widespread success.

1. Introduction

Global agriculture and farming practices—including deforestation and the removal of carbon sinks and burning of fossil fuels—account for roughly a quarter of total atmospheric emissions (Garnier et al., 2019). When considering other factors in food production, such as the making of fertiliser and shipping of products and inputs, 35% of all atmospheric greenhouse gases (GHG) may be attributed to the globalised food chain (Vermeulen et al., 2012). Sans and Combris's (2015) longitudinal study found that global meat consumption almost doubled over 50 years, from "23.1 kg per person per year in 1961 to 42.20 kg per person per year in 2011" (p. 106). Consumer reliance on traditional sources of meat is a major contributor to agricultural GHG.

Important innovations in food production have yielded alternative protein sources while reducing the resources needed to produce food staples such as plant-based alternatives to meat, genetically engineered food and naturally occurring alternative protein sources while potentially reducing the amount of GHG emitted by traditional livestock farming. The success of novel foods, often developed through scientific research, relies on consumer perception and adoption. A desire to buy nutritious food produced sustainably drives consumer interest in novel foods (Caparros Megido et al., 2014). Yet, most Western consumers do not gravitate to novel foods unless they mimic traditional looks, tastes or sources, often reacting with disgust or dismissing novel foods as not a viable long-term option. The adoption of novel foods is

hampered by entrenched attitudes, food-related concerns and socio-cultural norms.

Novel foods could help reduce the environmental impact of traditional farming by replacing some meat consumption, thereby reducing GHGs (Farchi et al., 2017; Njakou Djomo et al., 2020; Sans & Combris, 2015; Westhoek et al., 2014). Some studies find that a reduction by half in livestock farming could result in up to a 40% reduction in GHG emissions (Westhoek et al., 2014). A novel food is an innovative product that utilises new technologies or one that is or has been traditionally eaten outside a given jurisdiction, but not necessarily a newly developed food product (Tuorila & Hartmann, 2020). To date, no comprehensive examination of GHG emissions from the production of novel foods has been conducted. Given the scope of what is considered novel, this is unsurprising. In addition, food innovation exists on the frontier of the food supply chain and is often proprietary, making access to information about product development difficult. Therefore, it is difficult to compare emissions to traditional farming techniques. However, this does not alter the need to reduce the carbon footprint of traditional livestock farming or change the fact that reducing the impact of agriculture on climate change would require consumers to reduce traditional protein sources (Stehfest et al., 2009). The challenge for novel protein producers is to have consumers adopt the products in the face of traditional and long-held consumption patterns.

Human consumption of protein can be understood in two ways: health and culture. Meat is considered an important part of a healthy diet (Charlebois et al., 2020; Wyness, 2016). Meat provides essential nutrients such as protein and micronutrients such as iron, zinc and vitamin B12 (Godfray et al., 2018). However, in developed countries, meat tends to be overconsumed (Rust et al., 2020). While it is possible to obtain sufficient protein and nutrients without eating meat, it has an exalted place in Western culture. Present at almost all mealtimes and celebrations as a cultural norm, meat also serves as an expression of identity, legitimacy and masculinity (De Backer et al., 2020; De Groeve et al., 2019; Rosenfeld et al., 2019).

The year 2019 was a boon for plant-based protein products in the affluent North. Success stories such as Beyond Meat and the Impossible Burger brought plant-based protein alternatives out of the fringe-diet communities and into the mainstream (Heffernan, 2017). Indeed, plant-based proteins have been on the market for many years. Food items containing soy, tree nuts and legumes had attempted to replace traditional meat offerings with little success. While these meat substitutes create fewer emissions in their production process (Clune et al., 2017), they do not replicate meat in terms of taste, texture or smell. Consumers prefer beef burgers over plant-based alternatives (Slade, 2018; Tuorila & Hartmann, 2020). Given meat's cultural importance, plant-based alternatives face significant resistance from mainstream consumers.

In-vitro meat (IVM) exists on the edge of novel protein development. Grown in a laboratory environment using muscle stem cells, IVM presents a protein alternative that closely mimics traditional protein sources while using fewer resources and having a smaller carbon footprint (Bhat et al., 2019; Datar & Betti, 2010). However, for consumers, meat grown in a lab creates an ethical dilemma in addition to fear and disgust (Bryant & Barnett, 2019; Poirier & Russell, 2019; Zhang et al., 2020). Initial studies of IVM emissions suggest that cultured meat utilises fewer agricultural inputs and less total land than traditional farming (Mattick et al., 2015). However, Mattick et al. (2015) warn that despite this, "large-scale cultivation of in-vitro meat and the bioengineered products could represent a new phase of industrialisation with inherently complex and challenging trade-offs" (p. 11947).

There are protein alternatives consumed in cultures outside the Global North. An estimated 2 billion people regularly eat insects in some form (Nowak et al., 2016; Van Huis & Dunkel, 2017), while jellyfish food products are already popular in China and Southeast Asia, though this is based on limited species characterised by their stiffness and consistency (Leone et al., 2019). Due to climate change, the rise in ocean temperatures has seen exponential growth in the size and frequency of jellyfish blooms in waters globally (Torri et al., 2020). This has led to a focus on the potential growth of a global jellyfish fishing industry (Brotz & Pauly, 2017). Jellyfish may present a protein alternative that mitigates GHG by replacing or supplementing traditional protein sources and represents a financially viable product. Both insects and jellyfish are met with apprehension and disgust by consumers in most Western contexts. Indeed, Castro and Cham-

ber (2019a) demonstrate wholesale rejection across 13 countries.

Consumer food choices have an impact on global climate change. The switch to sustainable and scientific agricultural products is paramount, but achieving consumer acceptance will be the largest hurdle. For example, a lack of motivation to eat more sustainably is a barrier to the regular consumption of plant-based meat alternatives (Hartmann & Siegrist, 2017). Valli et al. (2019) find that consumers are reluctant to reduce meat intake even in the face of negative health outcomes.

Canada presents an interesting case study for those concerned with strengthening sustainable agricultural practices. The average Canadian consumed 17.25 kg of beef and 16.84 kg of pork in 2019 (Government of Canada, 2020b) and 34.6 kg of chicken in 2018 (Government of Canada, 2020a). Comparatively, the United States consumed 26.3 kg of beef, 24 kg of pork and 50.1 kg of poultry (Organisation for Economic Co-operation and Development, [OECD] 2021). The United Kingdom consumed 11.4 kg of beef, 16 kg of pork and 30.1 kg of poultry during the same time frame (OECD, 2021). Although Canada is one of the largest global agricultural producers, research on the associated environmental footprint is in its infancy (Veeramani et al., 2017). Canada is not immune from the effects of climate change.

Consequently, many Canadians seek alternatives to traditional protein sources that will require scientific intervention to fulfil nutrition and sustainability goals but are less reliant on a globalised food chain. There is little research on how Canadian consumers perceive novel foods, such as insects, jellyfish or in-vitro meat products, as a potential food or food ingredient. Many studies consider consumer adoption of novel foods in terms of consumer neophobia, tolerance to disgust, health effects and policy; however, there are no studies in the literature specific to the Canadian context.

Therefore, to understand what product characteristics influence individual adoption levels of novel foods, we need to understand how socio-demographic variables intersect. In response to these challenges, this study aims to measure Canadian consumers' likelihood of adopting novel foods using two key personality traits, disgust and food neophobia. In addition, the study looks at key demographic information as well as novel food acceptance as predictors of favourable perceptions of sustainable agriculture techniques.

2. Methods

2.1 Research Methods

This study used a Qualtrics online survey platform to conduct the survey in French and English over seven days in June 2020. The sample was drawn from a panel hosted by Angus Reid, a Canadian market research firm. The survey sample was drawn from over 1.3 million self-selecting Canadian consumers to reach a cross-section of Canadians. The precision of Angus Reid Forum online polls is measured using a credibility interval. In this case, the poll is accurate to within± 3.2 percentage points, 19 times out of 20, had all Canadians been polled. The Research Ethics Board granted ethical approval at the researchers' home university. Respondents who may have found questions to be offensive or disturbing were encouraged to remove themselves from the survey. Data were collected using a quota system based on Canadian Census data from 2016 of age and gender; quotas on the sample are a representation of the population across six regions: British Columbia, the Prairies, Ontario, Quebec, the Atlantic Provinces, and the North. Incomplete responses were removed before data analysis leaving a total number of completes at 993.

The survey instrument was divided into eight sections. Sections 1 to 3 measured personality traits related to food neophobia and disgust of respondents. Sections 4 through 6 measured the likeliness to accept jellyfish, insects and in-vitro meat as food products. Section 7 probed respondents on attitudes towards sustainable agriculture practices. The last section focused on demographic considerations to better understand how gender, income, education, etc., affect the acceptance of novel foods.

In keeping with other studies that measure the likelihood of food adoption (Johns et al., 2011; Rioux, 2020; Torri et al., 2020), Pliner and Hobden's (1992) scale of measuring food neophobia was used to determine the likelihood of adoption of novel foods as a protein source. This study used a 5-point Likert scale—1 Strongly agree, 2 Agree, 3 Neither disagree nor agree, 4 Disagree, 5 Strongly disagree—for respondent com-

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fort. Reverse statements were recalculated to give each respondent a score from 10 to 50, with higher scores indicating that respondents are more likely to try new foods and lower scores indicating a reluctance to try new foods.

Core disgust sensitivity was measured using an adapted version of Haidt et al.'s (1994) Disgust Scale. Due to the nature of some of the questions in the Disgust Scale, the response rate was lower and completion time in field was longer than anticipated. The scale was divided into two subscales with 5-point Likert scales; namely, 1 Strongly agree, 2 Agree, 3 Neither disagree nor agree, 4 Disagree, 5 Strongly disagree for subscale 1, and 1 Not at all disgusting, 2 Slightly disgusting, 3 Mildly disgusting, 4 Very disgusting, 5 Extremely disgusting for subscale 2. Some statements were reversed for internal consistency. Overall scores ranged from 14 to 70, with high scores indicating the participant experiences higher rates of disgust.

The survey explored three potential novel foods: jellyfish, insects and in-vitro meat. Three proteins were chosen among many suitable options as representatives of broad categories of alternative proteins. Insects as a general category was chosen because of recent investments in the Canadian market. Insect production plants have opened in three provinces, Alberta (Ward, 2018), Quebec (CBC News, 2018) and Ontario (Lancione, 2020), with considerable investment from the Canadian federal government (CBC, 2018; Lancione, 2020). Reports about edible insect protein have been a regular feature in national and provincial print and television media (Baxter, 2017; De Bono, 2020; Nguyen, 2020; Stephenson, 2018). Jellyfish, a natural resource, is an attractive option because producers would have low switching costs in an established fishing industry. Warming ocean temperatures have created an environment conducive to jellyfish blooms (Brotz & Pauly, 2017; Torri et al., 2020), making it a potentially profitable protein source. Although jellyfish are eaten as a protein source in international markets (Brotz et al., 2017; Brotz & Pauly, 2017), it is a novel protein option in Canada, where consumers rely on traditional protein sources. Finally, in-vitro meat was chosen as a broad category because it reflects the recent trend of technology-based imitation meat alternatives similar to the Beyond Beef Burger and the Impossible Burger (Splitter, 2019). Plant-based imitation meat is a conventional approach to protein alternatives that consumers utilise with specific dietary preferences or needs. Generally, these products are segregated from the traditional protein sources in the meat aisle in food markets. However, recent technological advancements in plant-based alternatives have gained popularity among consumers with no dietary preference and become more mainstream (Charlebois et al., 2020; O'Connor). Beyond Beef burger patties are now found in the meat aisle alongside traditional meat products (Bellon, 2019).

Each novel food was presented in 10 statements measuring acceptance with a 5-point Likert scale: 1 Strongly agree, 2 Agree, 3 Neither disagree nor agree, 4 Disagree, 5 Strongly disagree. Reverse statements were recalculated, and each participant was then given a score per novel food where a value of 1 to 3 was considered not at all accepting, 4 to 6 was considered moderately accepting and 7 to 10 was considered accepting. Each protein was presented without significant definitions on the state of the product (processed or whole food) to keep the survey simple for respondents and allow them to answer in accordance with their personal frame of reference. A series of statements about dietary changes was presented to better understand Canadians' attitudes towards sustainable agricultural practices. A 5-level Likert scale (1 Strongly agree, 2 Agree, 3 Neither disagree nor agree, 4 Disagree, 5 Strongly disagree) was used to measure both acceptance and willingness to change.

2.2 Data analysis

All statistical analysis was completed using IBM SPSS Statistics version 25. Cronbach's α was used to test the internal consistency and reliability of each part of the survey: food neophobia, disgust, willingness to eat each of the novel foods, and importance of sustainable agriculture. The dimensionality of the scores obtained in each survey section was examined using Exploratory Factor Analysis. Correlation between section questions and correlation between questions with each section's total score were measured by calculating Pearson's correlation coefficients. Principal Component Analysis was used to determine the relationships among variables further.

The corresponding score value was divided into three

categories for each section of the survey based on their corresponding scale values. Scale values were obtained by dividing the range of the section into 10 segments and assigning a value from 1 to 10. Scale values of 1–3, 4–6 and 7–10 determined placement into one of three corresponding groups.

3. Results

3.1 Comparisons of Segmentations

Food neophobia (FN) was divided into unwilling, somewhat willing and willing to try new foods for groups of 5.2% (n = 52), 28.7% (n = 285) and 66.1% (n = 656) of the population, respectively. The unwilling group scored between 10–21 on the Likert scale (mean 17.6), whereas the somewhat willing group scored between 22–33 (mean 28.6) and the willing group scored between 34–50 (mean 40.9).

Disgust sensitivity (DS) was similarly divided into not easily disgusted, somewhat disgusted and easily disgusted for groups of 5.9% (n = 59), 67.5% (n = 670) and 26.6% (n = 264) of the population, respectively. The not easily disgusted group scored between 14–31 on the Likert scale (mean 28.7), whereas the somewhat disgusted group scored between 32–47 (mean 40.4) and the easily disgusted group scored between 48–70 (mean 52.3).

Of the novel foods, the jellyfish (JF) consumption scores were divided into unaccepting, somewhat accepting and accepting for groups of 30.2% (n = 300), 48.5% (n = 482) and 21.2% (n = 211) of the population, respectively. The unaccepting group scored between 10–21 on the Likert scale (mean 16.6), whereas the somewhat accepting group scored between 22–33 (mean 27.8) and the accepting group scored between 34–50 (mean 38.9).

Similarly, the insect (INSect) consumption scores were divided into unaccepting, somewhat accepting and accepting for groups of 32.6% (n = 324), 39.7% (n = 394) and 27.7% (n = 275) of the population, respectively. The unaccepting group scored between 10–21 on the Likert scale (mean 16.5), whereas the somewhat accepting group scored between 22–33 (mean 27.6) and the accepting group scored between 34–50 (mean 39.3).

The lab-grown meat (IVM) consumption scores were divided into unaccepting, somewhat accepting and accepting for groups of 14.2% (n = 141), 34.6% (n = 344) and 51.2% (n = 508) of the population, respectively. The unaccepting group scored between 10–21 on the Likert scale (mean 16.3), whereas the somewhat accepting group scored between 22–33 (mean 28.4) and the accepting group scored between 34–50 (mean 40.7).

Finally, the sustainable agriculture (SA) value scores were divided into unimportant, somewhat important and important for groups of 6.2% (n = 62), 35.1% (n = 349) and 58.6% (n = 582) of the population, respectively. The unimportant group scored between 7–15 on the Likert scale (mean 11.9), whereas the somewhat important group scored between 16–24 (mean 21.1) and the important group scored between 25–35 (mean 28.8).

3.2 Effects of demographics on acceptance scores (JF, INSect, IVM, SA)

Pearson correlation coefficients were computed to examine the relationships between the novel food acceptance scores (JF, INSect, IVM), personality traits (FN, DS), gender, age and sustainable agriculture value (SA). The significance criterion was set at alpha = 0.05. The novel food acceptance scores and the sustainable agriculture value score were further examined through hierarchical multiple linear regression (HMLR) analysis to identify which predictors had the greatest impact on the score values. The analysis focuses on the impact of the demographic predictors (age, gender) in step 1, in step 2 FN and DS are added and in step 3 the non-subject novel foods are added (i.e. INSect and IVM are added when examining JF; all three are added when examining SA). The analysis ends for SA after step 3; however, the novel foods examine an additional predictor when, in step 4, SA is added to check the impact of sustainable agriculture values. In this manner, the gradual addition permitted observation of whether and to what extent new variables contributed to the prediction of the score being analysed. The coefficients were examined for significant differences at a significance level of 5%.

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3.3 Reliability

Satisfying internal consistency was found for both FN and DS scores, with Cronbach's alpha equal to 0.893 and 0.736, respectively. Results of the factor analysis showed that food neophobia possessed two dimensions, which were associated with an equal number of questions. Comparatively, disgust sensitivity was observed to possess four distinct dimensions, two of which were associated with five questions, and the other two dimensions were associated with two questions each.

Excellent internal consistency was found for the jellyfish acceptance score (Cronbach's alpha = 0.905), whose questions were all positively and significantly correlated. Loading scores from the exploratory factor analysis indicated that seven of the 10 questions described the first dimension, while three described a second dimension. Pearson correlation coefficients between questions ranged from 0.177 to 0.771, and the total correlation between questions and the JF score ranged from 0.512 for question 30 to 0.856 for question 31. PCs explained 66.95% of variability, with PC1 explaining 54.68% while PC2 explained 12.28%.

Similarly, excellent internal consistency was found for the insect acceptance score (Cronbach's alpha = 0.920), whose questions were all positively and significantly correlated. Loading scores from the exploratory factor analysis indicated that seven of the 10 questions described the first dimension, while three described a second dimension. Pearson correlation coefficients between questions ranged from 0.129 to 0.817, and the total correlation between questions and the INSect score ranged from 0.520 for question 40 to 0.876 for question 41. PCs explained 72.17% of variability, with PC1 explaining 58.66% while PC2 explained 13.51%.

Also, excellent internal consistency was found for the insect acceptance score (Cronbach's alpha = 0.920), whose questions were all positively and significantly correlated. Loading scores from the exploratory factor analysis indicated that seven of the 10 questions described the first dimension, while three described a second dimension. Pearson correlation coefficients between questions ranged from 0.129 to 0.817, and the total correlation between questions and the INSect score ranged from 0.520 for question 40 to 0.876 for question 41. PCs explained 72.17% of variability, with PC1 explaining 58.66% while PC2 explained 13.51%.

The lab-grown meat acceptance score showed even greater internal consistency (Cronbach's alpha = 0.933) and displayed questions that were all positively and significantly correlated. Loading scores from the exploratory factor analysis indicated that five of the 10 questions described the first dimension and five described the second dimension. Pearson correlation coefficients between questions ranged from 0.241 to 0.855, and the total correlation between questions and the IVM score ranged from 0.600 for question 49 to 0.889 for question 44. PCs explained 73.17% of variability, with PC1 explaining 62.48% while PC2 explained 11.09%.

Finally, the value of sustainable agriculture score displayed very good internal consistency (Cronbach's alpha = 0.831), with questions that were all positively and significantly correlated. Loading scores from the exploratory factor analysis indicated that six of the seven questions described the first dimension, and question 56 described the second dimension. However, due to the low question count, no actions were taken to pursue one-dimensionality for the score. Pearson correlation coefficients between questions ranged from 0.072 to 0.652, and the total correlation between questions and the SA score ranged from 0.443 for question 56 to 0.826 for question 55. PCs explained 62.51% of variability, with PC1 explaining 51.68% while PC2 explained 10.83%.

3.4 Participant characteristics effects on FN & DS, JF, INSect, IVM

A gender effect was found for most variables (Table 1). Males scored higher than females for novel food acceptance (JF, INSect, IVM), while females scored higher for disgust sensitivity and sustainable agriculture value. The mean food neophobia values were approximately the same across genders.

Also, age affected all considered variables. Typically, the mean scores for each of the variables decreased as age increased. Notably, this implies that while disgust sensitivity decreased with age, food neophobia increased with age and consequently, the acceptance of novel foods decreased. Furthermore, sustainable agriculture practices are favoured by younger demo-

graphics.

3.5 Relationships among FN, DS, JF, IN, IVM, SA, age, gender

Significant correlations between FN, DS, JF, INSect, IVM, SA, age and gender were found (Table 2) considering the totality of the subjects. FN was observed to be significantly negatively correlated with DS. Each of the novel foods (JF, INSect, IVM) displayed a significant, moderate, positive correlation with FN, and a significant, moderate, negative correlation with DS. Significant, moderate, positive correlations were observed between the novel food scores and SA; the strongest correlations among variables were observed between JF and INSect (rho = 0.574) and IVM and SA (rho = 0.525).

Age was observed to have a significant, weak, negative correlation with FN, while it did not have a significant correlation with DS; age was observed to have a significant, weak, negative correlation with each of the novel food acceptance scores and SA. Comparatively, gender did not have a significant correlation with FN, but displayed a significant, weak, positive correlation with DS and SA, and a significant, weak, negative correlation with the novel foods. These observations confirm trends observed with the mean values in Table 1. Region was not typically significantly correlated with the other variables; there were significant, weakly

Table 1. Effects of Age & Gender

Effects of Age & Gender															
Variable	Range	Mean	SD	Median	Gender				Age						
					Males	Females	F	p-value	18-25	26-39	40-54	55-73	74+	F	p-value
FN	10-50	36.13	8.13	37	36.31	35.98	0.176	0.675	37.69	37.77	35.60	34.67	35.03	7.039	<0.001
DS	14-70	42.88	7.49	43	40.57	44.91	37.882	<0.001	44.06	42.30	43.36	42.74	41.43	2.821	0.024
JF	10-50	26.75	8.72	27	27.95	25.68	7.994	0.005	29.18	28.67	26.20	24.84	24.68	9.756	<0.001
INSect	10-50	27.23	9.51	27	28.72	25.93	7.948	0.005	27.32	29.36	27.11	25.62	24.75	7.251	<0.001
IVM	10-50	33.02	9.66	34	34.42	31.79	4.502	0.034	36.83	34.71	31.58	31.75	30.80	10.66	<0.001
SA	7-35	25.01	5.62	26	24.18	25.73	14.316	<0.001	26.09	25.94	24.35	24.52	23.93	5.416	<0.001
FN – Food Neophobia; DS – Disgust; JF – Jellyfish; IVM – In Vitro Meat; SA – Sustainable Agriculture															

Table 2. Pearson correlation coefficients within the attitude towards novel foods

Pearson correlation coefficients within the attitude towards novel foods (jellyfish consumption, JF; insect consumption, INSect; lab-grown meat consumption, IVM; sustainable agriculture, SA), personality traits (food neophobia, FN; sensitivity to disgust, DS) and demographics (gender, age, region). Pearson correlation coefficients in **bold** indicate a significant correlation ($p \leq 0.05$).

Variables	FN	DS	JF	INSect	IVM	SA	Gender	Age	Region
FN	1								
DS	**-0.299**	1							
JF	**0.498**	**-0.407**	1						
INSect	**0.476**	**-0.493**	**0.574**	1					
IVM	**0.375**	**-0.312**	**0.427**	**0.445**	1				
SA	**0.289**	-0.010	**0.199**	**0.318**	**0.525**	1			
Gender	-0.020	**0.289**	**-0.130**	**-0.147**	**-0.136**	**0.138**	1		
Age	**-0.150**	-0.030	**-0.190**	**-0.127**	**-0.176**	**-0.119**	0.026	1	
Region	**-0.067**	-0.009	**-0.124**	-0.005	-0.009	**0.098**	0.031	0.041	1

FN – Food Neophobia; DS – Disgust; JF – Jellyfish; IVM – In Vitro Meat; SA – Sustainable Agriculture

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Table 3a. Hierarchical multiple regression models explaining the attitude towards jellyfish as food

Hierarchical multiple regression models explaining the attitude towards jellyfish as food (JF; n=993)

JF	Variable	B	SE B	β
Step 1	Constant	34.510***	1.124	-
	Age	-1.531***	0.254	-0.187
	Gender	-2.185***	0.541	-0.125
Step 2	Constant	30.023***	2.163	-
	Age	-1.139***	0.215	-0.139
	Gender	-0.635	0.473	-0.036
	FN	0.419***	0.030	0.391
	DS	-0.331***	0.033	-0.284
Step 3	Constant	14.784***	2.347	-
	Age	-0.763***	0.202	-0.093
	Gender	-0.335	0.440	-0.019
	FN	0.259***	0.030	0.241
	DS	-0.155***	0.034	-0.133
	INSect	0.292***	0.029	0.319
	IVM	0.121***	0.025	0.134
Step 4	Constant	14.827***	2.340	-
	Age	-0.758***	0.201	-0.093
	Gender	-0.085	0.448	-0.005
	FN	0.266***	0.030	0.248
	DS	-0.135***	0.034	-0.116
	INSect	0.307***	0.029	0.334
	IVM	0.159***	0.028	0.176
	SA	-0.128**	0.047	-0.082

Note: R2 = 0.052 for Step 1 (p < 0.001), ΔR2 = 0.289 for Step 2, R2 = 0.341

for Step 2 (p < 0.001), ΔR2 = 0.094 for Step 3, R2 = 0.435 for Step 3

(p < 0.001), ΔR2 = 0.004 for Step 4, R2 = 0.439 for Step 4 (p<0.001).

*p < 0.05. ** p < 0.01. *** p < 0.001.

Table 3b. Hierarchical multiple regression models explaining the attitude towards insects as food

Hierarchical multiple regression models explaining the attitude towards insects as food (INSect; n=993)

INSect	Variable	B	SE B	β
Step 1	Constant	34.604***	1.235	-
	Age	-1.104***	0.279	-0.124
	Gender	-2.731***	0.594	-0.143
Step 2	Constant	36.452***	2.307	-
	Age	-0.769**	0.229	-0.086
	Gender	-0.504	0.505	-0.026
	FN	0.406***	0.031	0.347
	DS	-0.487***	0.035	-0.384
Step 3	Constant	20.621***	2.452	-
	Age	-0.198	0.216	-0.022
	Gender	-0.096	0.466	-0.005
	FN	0.214***	0.032	0.183
	DS	-0.336***	0.035	-0.264
	JF	0.329***	0.032	0.302
	IVM	0.158***	0.026	0.16
Step 4	Constant	19.459***	2.413	-
	Age	-0.188	0.212	-0.021
	Gender	-0.674	0.467	-0.035
	FN	0.184***	0.032	0.158
	DS	-0.368***	0.034	-0.29
	JF	0.334***	0.032	0.306
	IVM	0.062*	0.030	0.063
	SA	0.300***	0.048	0.178

Note: R2 = 0.037 for Step 1 (p < 0.001), ΔR2 = 0.332 for Step 2, R2 = 0.369

for Step 2 (p < 0.001), ΔR2 = 0.096 for Step 3, R2 = 0.465 for Step 3

(p < 0.001), ΔR2 = 0.021 for Step 4, R2 = 0.486 for Step 4 (p<0.001).

*p < 0.05. ** p < 0.01. *** p < 0.001.

Table 3c. Hierarchical multiple regression models explaining the attitude towards lab-grown meat as food

Hierarchical multiple regression models explaining the attitude towards lab-grown meat as food (IVM; n = 993)

IVM	Variable	B	SE B	β
Step 1	Constant	41.433***	1.248	-
	Age	-1.568***	0.282	-0.173
	Gender	-2.539***	0.600	-0.131
Step 2	Constant	37.775***	2.627	-
	Age	-1.247***	0.261	-0.137
	Gender	-1.263*	0.575	-0.065
	FN	0.344***	0.036	0.290
	DS	-0.272***	0.040	-0.211
Step 3	Constant	23.979***	2.907	-
	Age	-0.859**	0.254	-0.095
	Gender	-1.031	0.551	-0.053
	FN	0.175***	0.039	0.147
	DS	-0.101*	0.043	-0.078
	JF	0.191***	0.040	0.172
	INSect	0.221***	0.037	0.218
Step 4	Constant	17.390***	2.572	-
	Age	-0.651**	0.223	-0.072
	Gender	-2.306***	0.488	-0.119
	FN	0.078	0.034	0.066
	DS	-0.196***	0.038	-0.152
	JF	0.193***	0.035	0.174
	INSect	0.069	0.034	0.068
	SA	0.783***	0.045	0.456

Note: R2 = 0.048 for Step 1 ($p < 0.001$), ΔR2 = 0.160 for Step 2, R2 = 0.208

for Step 2 ($p < 0.001$), ΔR2 = 0.074 for Step 3, R2 = 0.274 for Step 3

($p < 0.001$), ΔR2 = 0.170 for Step 4, R2 = 0.444 for Step 4 ($p<0.001$).

*p < 0.05. ** p < 0.01. *** p < 0.001.

Table 3d. Hierarchical multiple regression models explaining the attitude towards sustainable agriculture

Hierarchical multiple regression models explaining the attitude towards sustainable agriculture (SA; n = 993)

SA	Variable	B	SE B	β
Step 1	Constant	24.440***	0.732	-
	Age	-0.649***	0.165	-0.123
	Gender	1.592***	0.352	0.141
Step 2	Constant	15.442***	1.619	-
	Age	-0.413*	0.161	-0.078
	Gender	1.531***	0.354	0.136
	FN	0.201***	0.022	0.291
	DS	0.027	0.025	0.035
Step 3	Constant	1.224	1.628	-
	Age	-0.008	0.138	-0.001
	Gender	1.937***	0.299	0.172
	FN	0.071**	0.021	0.102
	DS	0.151***	0.023	0.201
	JF	-0.059**	0.022	-0.092
	INSect	0.128***	0.02	0.217
	IVM	0.300***	0.017	0.515

Note: R2 = 0.034 for Step 1 ($p < 0.001$), ΔR2 = 0.078 for Step 2, R2 = 0.112

for Step 2 ($p < 0.001$), ΔR2 = 0.260 for Step 3, R2 = 0.372 for Step 3

($p < 0.001$). *p < 0.05. ** p < 0.01. *** p < 0.001.

FN – Food Neophobia; DS – Disgust; JF – Jellyfish; IVM – In Vitro Meat; SA – Sustainable Agriculture

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negative correlations associated with FN and JF, and a significant, weakly positive correlation associated with SA.

For each of the novel foods and the sustainable agriculture variable, an HMLR was performed to assess the effect of gender, age, FN, DS, the other novel food scores, and SA as predictors. When assessing the predictors for JF, a four-step process was conducted (Table 3).

The inclusion of age and gender in the first step was significant, R2= 0.052, F(2, 990) = 27.003, p<0.001.

The addition of FN and DS in step 2 resulted in a large significant increase in
R2, ΔR2=0.289, ΔF(2, 988) = 127.957, p<0.001.

In the third step, the other novel food scores were added with a small significant increase in
R2, ΔR2=0.094, ΔF(2, 986) = 126.386, p<0.001.

The final step, which added SA, saw a very small significant increase in
R2, ΔR2=0.004, ΔF(1, 985) = 110.122, p<0.001.

INSect was the strongest positive predictor β=0.334, t(985)=10.601, p<0.001; FN was the next strongest predictor β=0.248, t(985)=8.822, p<0.001, followed by IVM with β=0.176, t(985)=5.571, p<0.001. DS was the most strongly negative predictor β=-0.116, t(985)=-3.908, p<0.001. These results suggest that lower DS and higher FN, INSect, and IVM resulted in higher JF. Age, gender, and SA were weak negative predictors.

Assessing the predictors for INSect also involved a four-step process (Table 3). The inclusion of age and gender in the first step was significant, R2= 0.037, F(2, 990) = 18.895, p<0.001. The addition of FN and DS in step 2 resulted in a large significant increase in R2, ΔR2=0.332, ΔF(2, 988) = 144.530, p<0.001. In the third step the other novel food scores were added with a small significant increase in R2, ΔR2=0.096, ΔF(2, 986) = 142.927, p<0.001. The final step, which added SA, saw another small significant increase in R2, ΔR2=0.021, ΔF(1, 985) = 132.922, p<0.001. JF was the strongest positive predictor β=0.306, t(985)=10.601, p<0.001; SA was the next strongest predictor β=0.178, t(985)=6.281, p<0.001, followed by FN with β=0.158, t(985)=5.728, p<0.001. DS was the most strongly negative predictor with β=-0.290, t(985)=-10.726, p<0.001. These results suggest that lower DS and higher FN, JF, and SA resulted in higher INSect scores. Age and gender were not significant predictors; IVM was a weakly positive predictor with a lower significance (p<0.05).

Another four-step HMLR process assessed the predictors for IVM (Table 3c).

The inclusion of age and gender in the first step was significant, R2= 0.048, F(2, 990) = 25.079, p<0.001.

The addition of FN and DS in step 2 resulted in a moderate significant increase in
R2, ΔR2=0.160, ΔF(2, 988) = 64.734, p<0.001.

In the third step the other novel food scores were added with a small significant increase in
R2, ΔR2=0.074, ΔF(2, 986) = 62.017, p<0.001.

The final step, which added SA, saw another moderate significant increase in
R2, ΔR2=0.170, ΔF(1, 985) = 112.582, p<0.001.

SA was the strongest positive predictor β=0.456, t(985)=17.386, p<0.001; JF was the next strongest predictor β=0.174, t(985)=5.571, p<0.001. DS was the most strongly negative predictor with β=-0.152, t(985)=-5.186, p<0.001, followed by gender with β=-0.119, t(985)=-4.725, p<0.001. These results suggest that lower DS and higher SA and JF resulted in higher IVM scores; the results also indicate that males are more accepting of IVM as a food source. FN and INSect were not significant predictors; age was a weakly negative predictor with a lower significance (p<0.01).

Finally, a three-step HMLR process assessed the predictors for SA (Table 3d). The inclusion of age and gender in the first step was significant, R2= 0.034, F(2, 990) = 17.510, p<0.001. The addition of FN and DS in step 2 resulted in a small significant increase in R2, ΔR2=0.078, ΔF(2, 988) = 31.142, p<0.001. In the final step, the novel food scores were added with a large significant increase in R2, ΔR2=0.260, ΔF(3, 985) = 83.475, p<0.001. IVM was the strongest positive predictor, β=0.515, t(985)=17.386, p<0.001; INSect was the next strongest predictor, β=0.217, t(985)=6.281, p<0.001, followed by DS with β=0.201, t(985)=6.516,

p<0.001, and gender with β=0.172, t(985)=6.478, p<0.001. These results suggest that higher IVM, IN-Sect and DS scores resulted in higher SA scores; the results also indicate that females are more likely to value sustainable agriculture. FN was a less significant positive predictor (p<0.01), whereas JF was a less significant negative predictor (p<0.01); age is not a significant predictor for SA scores.

4. Discussion

Producing beef for mass protein consumption is arguably the most damaging of food systems in terms of GHG and a critical element in facilitating the progress of anthropogenic climate change. Therefore, diversifying protein intake to include offerings with less GHG emissions provides a unique challenge to global food systems where beef has exalted status. Nevertheless, if food systems scientists are serious about reducing GHG from protein intake, consumers' willingness to adopt alternative proteins must be considered. Simply expanding the availability of different proteins to consumers does not necessarily mean they switch to lower emissions choices, as evidenced by this survey.

This analysis compares three types of alternative proteins—cultured meat, jellyfish and insects. Of the three, jellyfish had the lowest overall adoption score. This is unsurprising given that jellyfish is not traditionally consumed in Canadian culture and is viewed as a pest by many Canadians because of their effect on tourism and traditional fisheries (Brotz et al., 2017). Perhaps jellyfish would not be viable as a main course for dinner, but processed jellyfish could be a source of protein as an additive to other foods, including soups, salads and dessert dishes such as ice cream (Simpson, 2009).

The viability of both insects and jellyfish as processed ingredients for other foods has potential. Start-up food tech companies are exploring both for their richness in protein (Mintah et al., 2020) and omega and collagen properties (Khong et al., 2016). Yet, each has specific hurdles that must be overcome. First, insects are generally thought of as 'dirty' (Castro & Chambers, 2019b). Given the breadth of insect types, consumers will not discern edible insects from household pests.

While processors can reduce insects to powder, the data from the disgust scale in this study suggests that years of insect avoidance requires more than novelty to win over consumers. Jellyfish, on the other hand, is elusive for most consumers as many have never encountered them in their natural environment. However, the texture of jellyfish is difficult to overcome for most people. Once processed, jellyfish could become a nutraceutical with antioxidant benefits (Leone et al., 2019). Further research on the likelihood of adoption of these proteins as processed additives is warranted.

The results show that age is a significant indicator of adopting alternative proteins, with older demographics less likely to adopt new sources. However, older demographics are more likely to adopt cultured meat than other alternative protein sources. This is in keeping with research coming out of the United States (Van Loo et al., 2020). This could be because of the imitation of traditional meat sources in which texture and flavour are familiar. Scientists have not been able to replicate the best cuts of beef with cultured meat (Purdy, 2020; Stephens et al., 2018). Of the three alternatives presented, cultured meat is still experimental and expensive to produce; moreover, regulatory frameworks prohibit its sale in the Canadian market (Hopkins, 2015; Purdy, 2020). However, investment in insects as a source of protein has been met with favourable regulatory environments and media attention (CBC, 2018; Lancione, 2020; Nguyen, 2020; Stephenson, 2018). Still, the environmental consequences of switching to cultured meat as a replacement for traditional beef remain unclear.

Gender was a significant factor in the perception of sustainable agriculture. Female respondents were more in favour of the promotion of sustainable agriculture techniques but less likely to adopt alternative proteins to support sustainable agriculture. This could be because women are more likely to adopt plant-based diets (Charlebois et al., 2020; Rosenfeld, 2020) or flexitarian approaches to dieting (Rosenfeld et al., 2019). Unsurprisingly, those respondents who were likely to adopt any of the three alternative proteins in the survey were more favourably disposed towards sustainable agriculture overall. This suggests a link between the two and a problem for those looking to change agriculture techniques. Success with sustainable agriculture depends, in part, on consumer buy-in. The results of this study serve as a warning to inves-

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tors, both private and public, that consumers have a significant role in the success of new foods. In the case of insects, despite insect farming and edible insect initiatives gaining popularity in the Canadian market for investors, media and the federal government, the fact remains that the consumers have not warmed to the idea of consuming insects as a regular protein alternative. This implies that insects may be better used as an input to traditional farming than as a food product on the shelves of supermarkets, though the environmental benefits of doing so remain uncertain. Further, consumers were also reticent about consuming jellyfish as an alternative protein. This suggests that even though natural resources could be exploited cost-effectively with potential benefits to ocean systems, this would not overcome consumers' reluctance to switch from traditional to alternative seafood. However, it should be mentioned that lobster, once considered a lower-income food worthy only of servants and prisoners, overcame social taboos to become a highly sought-after seafood (Tye et al., 2011). Perhaps jellyfish could experience the same cultural relevance over time.

Interestingly, this research implies that a pathway to sustainable agriculture in Canada lies with science and technology, but it might be the farthest from becoming a reality due to an unfriendly regulatory environment and consumer preference. This is unsurprising as the food industry has a history of pivoting to imitation to satisfy alternative dietary choices rather than switching. While the regulatory bodies dither on allowing cultured meat into the Canadian market, technology investments support international start-ups working on viable cultured meat options (Stephens et al., 2018), leaving Canadian alternatives to fall behind in the science and potential market share (Purdy, 2020).

There are limitations with this research. First, this is self-reported survey data. It could be that respondents were aspirational in the responses rather than truthful (Subar et al., 2015). In addition, it is impossible to declare whether food neophobia changes over time using these data. The data suggest that younger respondents are less likely to exhibit food neophobia, but there is no indication that this will remain steady as those respondents age. The study analysed only three alternative sources of protein among many. These were chosen based on popular Canadian media reports. Future research should include a wider variety of alternative protein sources. Finally, alternative protein sources were presented without the suggestion of how they may be consumed. This was done so as not to bias potential responses.

5. Conclusions

This study reveals initial insights into the adoption of alternative proteins in the Canadian context. Canadian protein consumption has far-reaching global environmental consequences, impacting middle- and lower-income countries globally. Canadian consumers must seriously consider making changes to traditional agricultural techniques that release high amounts of GHG into the atmosphere. Cultured or in-vitro meat might be a viable pathway for food systems to reduce harmful impacts of traditional agriculture if scientists can successfully imitate popular beef cuts and, most importantly, ensure that cultured meat does not create a different but similarly harmful set of environmental externalities. Nevertheless, cultured meat remains in regulatory limbo as policymakers are reluctant to allow it into the protein marketplace.

Adopting sustainable food systems will necessitate a move away from traditional protein sources. However, the challenge remains that consumers, producers and policymakers in Canada are reluctant to do so, even in the face of anthropogenic climate change. Whether science can offer exact replicas of traditional protein sources or consumers adopt protein sources popular in other cultures, change is slow to take place. It is encouraging that younger generations see the need for change in order to reduce the carbon footprint of the protein food supply. However, without producers and policymakers fully understanding consumers' perceptions of alternative proteins, serious reduction in environmental consequences from protein production will be slow or miss the mark completely.

Conflict of interest

The authors declare no conflict of interest. The funder had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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Research Paper

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Financial inclusion in the Global South: an analysis of index-based agricultural insurance and farmer food security in India

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Index-based agricultural insurance (IBAI) is presented by several development organisations as a highly effective way of mitigating climate change-related risks and improving farmer food security. However, critics doubt the effectiveness of the instrument and regard it as a new frontier for capital accumulation. Linking to this debate, this research uses a qualitative design to investigate how IBAI affects the food production and consumption of farmers in the Indian state of Karnataka. It finds that the proposed benefits of the instrument are overestimated. Most of the major issues reported by farmers cannot be addressed by insurance. Moreover, using the alternative concept of food sovereignty, the research suggests that several problems reported by interviewees, such as unstable market prices, unequal land distribution and missing irrigation, require political action rather than financial inclusion.

1. Introduction

As numerous scholars point out, financial inclusion in the Global South has increasingly become the focus of development and international financial institutions over the last few years (Breger Bush, 2012; Mader, 2018; Soederberg, 2013). Financial inclusion is understood as opening access to financial services to people who have previously been excluded from them (World Bank, 2018).

Supporters of micro-finance see insurances as an untapped potential for financial inclusion. According to the Micro Insurance Network (2017), a coalition of development institutions and businesses aiming to promote micro-insurances, the Global South has an "…enormous potential for growth"(p. 3). One widely advocated insurance form for financial inclusion is index-based agricultural insurance (IBAI), where a data-driven index serves as a proxy for developments in the field and determines whether farmers receive indemnities. Proponents see this as a cost-efficient way of managing payouts, thus allowing more farmers to gain access to insurance at a reasonable price (Isakson, 2015a).

India has the largest market for IBAI in the world (Greatrex et al., 2015, p. 9). With the government-sponsored Pradhan Mantri Fasal Bima Yojana (PMFBY) and Weather Based Crop Insurance Scheme (WBCIS), tens of millions of farmers use insurance products. The agricultural sector plays an essential role in the economy and employs more than 50 per cent of the population. Poverty and food insecurity are widespread, with around 30 per cent of the population living below the poverty line (International Food Policy Research Institute, n. d.). These characteristics make the country a suitable case study.

The goal of this paper is to research how farmers make use of insurance to secure their livelihoods and food security. Its central argument is that IBAI cannot deliver the proposed benefits because it does not address the underlying causes of farmer's food insecurity. The methodology includes qualitative research that facilitates an in-depth study of the issue at hand. The analysis additionally introduces the concept of food sovereignty to evaluate if it can serve as an alternative paradigm for rural development.

2. Literature review

Giné et al. (2010) pointed out the potential advantages of index-based insurance: risk mitigation and improved access to credits and inputs. In a quantitative study on index insurance in Kenya, Isaboke et al. (2016) found that uptake of index-based insurance had a positive effect on farmer food security and dietary diversity. Among other factors, insurance customers were more likely to ask for agricultural credit. This claim is contradicted by findings from Giné and Yang (2009), who conducted an experimental study in Malawi. They reported that farmers who were offered insurance were less likely to take out loans. Their explanation for this was that insurance costs made loans more expensive, comparable to a higher interest rate. Carter et al. (2016) maintained that the effect of index-insurance on uptake of new technologies is highly context-specific and that positive impacts of IBAI cannot be generalised.

Carter et al. (2018) used quantitative data from livestock insurance for cattle herders in Kenya and Ethiopia. They acknowledged the instrument's potential in mitigating climate change related to food insecurity but argued that success depended on insurance design.

In a randomised control study in India, Cole et al. (2017) found that farmers with index-insurance were more likely to plant high-risk, high-return cash crops. However, this shift in farming practices was limited to farmers with a higher level of education. Furthermore, while the survey found a change in farming practices, it did not draw any conclusions on the effects of these changes on farmer income and food security.

Isakson (2015a) concluded that IBAI is a way to deal with the consequences of increased risks rather than its origins. He maintained that IBAI does not address the root causes of vulnerability, which are growing financialisation and debt relations caused by farmer integration into agricultural value chains.
Based on a case study in Mongolia, Taylor (2016) found that index-insurance ignores the specific social structures which make certain groups more vulnerable to weather-related risks than others. Taylor maintained that insurance was a technical solution that did not consider how risk depended on an individual's social position.

Overall, index-insurance remains a comparatively under-researched area (Da Costa, 2013; Greatrex et al., 2015). Most of the existing empirical studies use quantitative data. Qualitative studies that allow an in-depth analysis of how index-insurance affects farmer's livelihood strategies and food security are largely missing, with Taylor's (2016) study on Mongolia being an exception.

3. Theoretical framework

3.1. The concept of Food Security

The concept of food security appeared on the international scene as a consequence of the food price crisis of 1972 – 1974 (Jarosz, 2014, p. 171). It has since then been an object of constant debate, which has led to several shifts in its definition and focus (Coates, 2013, p. 189). Jarosz (2011, p. 122) points out that conceptualisations of food security in the 1970s emphasised a need to secure sufficient food availability on the national or regional level. Food security policies focused on adequate national food production and national stocks for emergencies. The concept was production-centred and linked to the thinking of the "Green Revolution".

However, with the publication of Amartya Sen's work on famines in 1981, focus moved towards questions of access to food (Coates, 2013, p. 189). As Sen (1981, p. 433) points out in his work, food availability is not sufficient to ensure food security. In many cases, people starve even when there is adequate food available regionally. The reason for hunger often is not the lack of availability but the missing access to food.

Further research into the concept added a temporal dimension to the framework because it showed that

people are faced with situations in which they have to trade current food security against food security in the future (Maxwell, 1996, p. 158). Another critical addition to the concept has been the dimension of food utilisation (Coates, 2013, p. 189). Food utilisation includes access to clean water, appropriate storage facilities and the intra-household distribution of food. These aspects are important for assessing the food security of individuals when the unit of measurement is the household (FAO, 2008, p. 1).

3.2. The concept of Food Sovereignty

The food security concept remains a contested framework that continues to be criticised from various angles (Hayes-Conroy & Sweet, 2015, p. 375). One of the most notable results of these critiques has been the emergence of the food sovereignty concept. Since its first formulation by the global peasant organisation La Via Campesina in 1996, it has gained importance and is now part of the FAO's public deliberations as well as background for food legislation in several countries (Lawrence & McMichael, 2012, p. 135).

Advocates of food sovereignty criticise food security as apolitical and negligent on questions of origin and production of food. They see trade liberalisation and the increasing importance of markets and transnational corporations in agriculture as one of the main obstacles to fighting hunger and malnutrition (Patel, 2009, p. 665). They argue that economic liberalisation has deprived national governments of their authority of protecting their markets, with detrimental results to smallholders in the Global South. Thus, the food sovereignty movement aims to establish a stronger political control of the agricultural sector (Beuchelt & Virchow, 2012) and reorganise power in the global food system (Alonso-Fradejas, Borras, Holmes, Holt-Giménez, & Robbins, 2015, p. 439).

3.3. IBAI and Food Security

Advocates of IBAI see it as a useful tool for climate change adaptation and rural development. They argue that IBAI can improve farmer food security through access to high-value markets or contract farming arrangements (Hazell et al., 2010, p. 24). IBAI shall encourage farmers to take out credits to invest in new farming technologies and inputs. According to Hazell et al. (2010), this "…can lead to game-changing increases in farm productivity and income" (pp. 24-25). As Carter et al. (2014, p. 3) point out, farmers often rely on on-farm and off-farm employment to diversify income and minimise risks. Farmers with insurance can rely on insurance as a risk-mitigating strategy, which allows them to increase their farming income through specialisation.

Concerning food security, this means that IBAI potentially affects its temporal, availability and access dimension. IBAI should lead to more stable incomes that enable steady food consumption in terms of the temporal dimension. Regarding the access dimension, it can be expected that IBAI leads to a shift from a production-based entitlement structure towards a focus on trade-based entitlements. Additionally, households should be able to gain sufficient trade-based entitlements through their farming alone.

Despite the potential benefits, IBAI has several weaknesses. One of its main weaknesses is basis risk (Greatrex et al., 2015; Hazell et al., 2010; Sandmark, Debar, & Tatin-Jaleran, 2013). Basis risk refers to the possibility that the index does not correlate with the actual situation of a farmer. A farmer may lose parts or all of the harvest without receiving an indemnity payment (Sandmark et al., 2013, p. 19). Another aspect is the difference between income and yield (Binswanger-Mkhize, 2012, p. 190). Since the ability to consume depends on income, not yield, farmers need to insure their income. However, this is a much more difficult task than insuring yields. Income depends on the fluctuating prices of crops on the market. Thus, insurance is not a safety net against market volatilities. Concerning the four pillars of food security, these weaknesses potentially impact the availability, access and stability pillar. The possible negative effects can lead farmers from production-based entitlements towards trade-based entitlements that do not materialise because of unfavourable market conditions, leaving farmers with debts they cannot repay.

3.4. IBAI and Food Sovereignty

IBAI is an instrument that aims to make farmers more competitive in agricultural markets and protect them against climate change risks. It, therefore, follows a market-centred logic that food sovereignty rejects. Rather than making farmers fit for a competitive market environment, food sovereignty aims to adjust the

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economic environment of food producers to allow them to produce in an ecologically and socially sustainable way. While IBAI assumes that farmers need to adapt to the necessities of markets, food sovereignty takes the opposite logic and assumes that the economic conditions must adapt to make sustainable production possible.

3.5 Current insurance policies in India

There are currently two government-supported index-based crop insurance schemes in India, the WBCIS and the PMFBY scheme. While the WBCIS relies on weather-related data such as rainfall, temperature and wind speed to calculate the relevant index, the PMFBY scheme is based on a yield index. The payout of insurance coverage depends on the average expected yield in a given area. Government departments set the expected yield based on crop cutting experiments (Gulati, Terway, & Hussain, 2018).

Insurance is mandatory for farmers who take out a loan from a financial institution. In that case, the insurance premium is automatically deducted from the loan. In other cases, farmers can voluntarily insure their crops administered by private insurance companies and public bodies. While public bodies are responsible for providing weather data, private insurance companies handle the payout of indemnities (Indian Ministry of Agriculture and Farmers Welfare, n. d.).

4. Methodology

4.1. Study area

The study is based on data gathered through semi-structured interviews in the Indian state of Karnataka. Expert interviews were conducted in the city of Bangalore. Farmer interviews were conducted in five villages within an area of 70km around Bangalore. In Karnataka, only a small area of agricultural land is irrigated, which means that farmers are mainly dependent on weather conditions (Rajeev, Bhattacharjee, & Vani, 2015, p. 5). Agriculture is vulnerable to droughts, with 18 from 27 rural districts classified as drought-prone areas (Rajeev et al., 2015, p. 18). Next to weather-related risks, farmers are confronted with risks of unstable input prices as well as unpredictable prices for selling their produce (Rajeev et al., 2015, p. 29). Index-based insurance can have particular importance under these conditions (Rajeev et al., 2015).

4.2. Methods

The research uses qualitative methods. It aims to explore and understand how index-based insurance affects the livelihood strategies of Indian farmers and how it shapes their strategies to achieve food security. The research uses semi-structured interviews with farmers and experts to collect data. In the framework of this research, experts are regarded as persons who possess exceptional knowledge about a topic that influences the practice and actions of others (Bogner, Littig, & Menz, 2014, p. 14).

4.3 Sampling

The sampling applied in this study is based on snowball sampling as a suitable way to access populations with specific characteristics that are difficult to reach (Berg, 2001, p. 33). The sample includes farmers with land holdings ranging from 2 hectares to 8 hectares. No difference has been made between users of the PMFBY and WBCIS schemes. Even though they are different policies, they both follow the same logic of index-based insurance (Global Index Insurance Facility, n. d.).

Experts with different backgrounds were interviewed to approach the topic from various angles, including insurance providers and representatives of farmer organisations. Overall, 15 interviews were conducted. Four were expert interviews, and 11 were interviews with policyholders in five villages within a 70 km range around Bangalore. All interviews were conducted under the condition of anonymity.

4.4. Data analysis

The expert interviews were transcribed based on the recordings made during the interviews. For farmer interviews, the data analysis was done based on extensive field notes.

For the coding, categories based on the four dimensions of food security were developed into which the data was organised. In the second round of data anal-

ysis, In-Vivo coding was used. Saldana (2016, p. 105) refers to In-Vivo coding as a method to use the words of participants themselves to generate coding categories. This kind of coding has been used for findings that are significant for the research question but do not fit into the preconceived categories.

5. Results

5.1. IBAI and Food Security

Following the arguments of IBAI proponents, one should observe an increased willingness of farmers who use IBAI to invest in farming operations with higher risks. However, the interviews indicate that insurance has almost no influence on the way farmers are operating. Irrespective of farm size, none of the interviewed farmers reported that the availability of insurance had influenced their decision to take out credit or motivated investments. The principal reason given was that insurances only cover a small part of agricultural credits. Therefore, the risk for loan default mainly remains with the farmer and can cause substantial financial difficulties. As one of the interviewed experts expressed:
The availability of crop insurance claim is very little; it is very little amount. It doesn´t cover the whole expenditure that they have done on the crop rising. To a little extent, it may help (Anonymous, personal communication, August 14, 2019).

Another interviewed expert described farmers' actions to avoid loan defaults with the following:
If they need the cash right now, they will knock on each and every door, whether that is formal or informal, from first to last, hope is everybody. If it is delivered at a formal institution, perfectly fine, if it is settled at an informal institution that is also fine. So, in the sequence of priority they will move down across structures of society; they can take it from a formal institution or a family or a distant relative or an informal institution, they will knock on everywhere (Anonymous, personal communication, August 12, 2019).

The farmers mentioned the importance of informal sources of credit as a coping strategy for losses. There was a general agreement among them that they would rather rely on informal sources of money than on the banking system or insurance. One of the farmers expressed his opinion on formal credit sources as follows:
If you go to the bank, they will ask for a lot of documents, and it will take a lot of time. It can take six months to receive credit. So, we prefer to borrow from our neighbours or friends because it is easier (Anonymous, personal communication, September 12, 2019).
Six interviewees noted increasingly unstable rain and missing irrigation facilities as obstacles to diversifying their production. Nine interviewees indicated that they had switched from cultivating a diverse range of crops and vegetables towards a focus on Ragi (finger millet), which is more drought resistant. One of the interviewees stated:
With a bore well, we could also grow vegetables, but now we are dependent on Ragi because that is the only thing that we can grow here (Anonymous, personal communication, September 11, 2019).

As farmers and experts observed, climate change, increased construction activities, and the spatial expansion of Bangalore as an important economic centre are leading causes of insufficient water supply and irrigation. Receding groundwater levels make bore wells more and more challenging to drill and costly to maintain.

Another claim from IBAI proponents is that it can support farmer specialization, making it unnecessary to seek other employment for income diversification. However, interviewees with small plot sizes underlined the importance of additional off-farm employment to stabilize their incomes. Two other interviewees mentioned that while they did not seek off-farm employment because of limited qualifications, they would like to do so if there were employment opportunities available to them. Farmers with larger farms (around 8 hectares) did not usually mention off-farm employment as important because they stated that they could make a living based on farming alone.

A problem that came up in almost all farmer and expert interviews is basis-risk. Seven farmers reported that they had faced losses and did not receive a payout. One farmer mentioned that he had not incurred a loss; however, he received money from the insurance (Anonymous, personal communication, September 11, 2019). Experts maintained that basis-risk was a problem that could not be adequately met without

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changing the insurance design.

Next to the unpredictability of insurance due to basis-risk, many experts mentioned delayed payouts as an obstacle for the functioning of the insurance. Thus, even in cases where the insurance would step in, many farmers would still be reliant on informal sources of credit in the interim.

5.2. IBAI and Food Sovereignty

Many interviewees shared the sentiment of having little or no control over their economic environment. The majority of farmers complained about rising costs for fertiliser and incalculable produce prices. Many saw this kind of uncertainty as the most pressing problem. One of the farmers described his situation as follows:
The costs have gone up a lot, but you cannot know what you can receive [for your produce]. Prices go up and down all the time. But costs keep going up, up, up. But nobody listens to us farmers (Anonymous, personal communication, September 13, 2019.

Another finding of the research is that the question of land ownership is a central issue for the discussion of IBAI. In many cases, the holders of insurance policies are landowners who have migrated to Bangalore and rented out their land to tenant farmers. The tenant farmers who work the land are unable to apply for insurance coverage because a land title is required for this. According to one of the interviewed experts, this situation has become increasingly common as more landowners migrate to the cities and leave their land behind unoccupied or rent it out to smallholders (Anonymous, personal communication, August 28, 2019). The rapid economic development of Bangalore as a major IT centre speeds up this development. However, as the government subsidises the PMFBY and WBCIS, this means that the public money invested into the insurance does not benefit most smallholders, which are the ones that are most food insecure.

6. Discussion

Index-based insurance is presented as an instrument of financial inclusion that protects smallholders from climate change-related risks and allows them to enjoy the benefits of liberalised markets. The results of this research indicate that farmers do not generally experience IBAI as beneficial for their livelihoods. There is no evidence that the availability of insurance increases farmer investment into new seed varieties or external inputs. Instead, most interviewees noted other factors such as missing irrigation and water supply as the most important influence for their decision on what to grow. Another major concern was the unstable economic situation and the high fluctuation of prices. However, financial inclusion does address these issues. They are an outcome of rural development policies that have focused on the marketisation of agriculture (Daftary, 2020) and the removal of public investment into rural infrastructure such as irrigation facilities (Daftary, 2014). Efforts to modernise agriculture focusing on high-value produce have left out many smallholders (Douwe van der Ploeg, 2010).

Table 1. Overview of results

Food Security	Food Sovereignty
- No increased investments into new seed varieties or external inputs because insurance payouts are low and not reliable, thus no impact on food security	- Farmers face an increasingly insecure economic environment with decreasing prices for their produce and increasing input prices
- No specialisation on farming – off-farm employment remains important for income diversification, especially for farmers with small farms	- Farmers feel a lack of influence over their economic environment
- Insurance does not address the problem of unstable rain and receding levels of water supply	- Insurance reproduces inequality as farmers without land title are excluded from it

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In the specific context of Bangalore, this situation is aggravated by rapid urban extension and resource competition (Ramachandra, Sellers, Bharath, & Setturu, 2020).

As payouts are not reliable, IBAI does not help farmers in situations where their crops fail. Incidents where basis-risk prevented farmers from receiving payouts have been found frequently in the research. Basis-risk is inherent in the design of IBAI. Thus, the failure of the insurance to adequately support farmers cannot be attributed to a bad administration of the instrument. It is inherent in the product design.
Rather than relying on IBAI as a protection mechanism, farmers rely on informal ways of obtaining credit, such as friends and neighbours. These findings contrast with the expectations of its proponents that IBAI "…can lead to game-changing increases in farm productivity and income" (Hazell et al. pp. 24-25). Off-farm employment remains an essential source of income that helps farmers cope with the market's uncertainties.

Moreover, access to IBAI is highly unequal, as many smallholders who do not own land do not have access to insurance. At the same time, smallholders are the most food insecure. This shows that structural inequalities play a more prominent role than instruments for financial inclusion. However, these structural inequalities can only be addressed through adequate policies. In that context, the concept of food sovereignty offers a promising alternative to the mainstream approach of food security that generally neglects political factors. Despite the relatively clear-cut results of the research, it needs to be mentioned that the data have been gathered in a relatively small geographical area. Because PMFBY and WBCIS are national schemes and other parts of India are subject to similar dynamics regarding rural development, it seems plausible that the results indicate general dynamics of financial inclusion in the country. However, this is a tentative suggestion that the data cannot directly substantiate.

7. Conclusion

Financial inclusion of smallholders through index-based insurances cannot improve farmer food security for two reasons: First, the instrument does not meet the high expectations of its proponents. Payouts are unreliable, and the payouts are too small to bring financial security to farmers. Secondly, the most pressing issues for farmers are an outcome of rural development policies that have left behind many smallholders. An alternative approach to this failed approach to agricultural modernisation needs to take these policy failures into account rather than to apply a technical fix in the form of a financial instrument.

Conflict of interest

The author declares no conflict of interest. Besides, the funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

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The impact of COVID-19 on global food system. Fundamental Changes Needed at UN Summit to Tackle Global Food Insecurity

http://www.ipsnews.

A market vendor sells produce at Victoria Market in Port Victoria, Seychelles. Credit: UN Women/Ryan Brown

By Nick Nisbett, Lesli Hoey and Jose Graziano da Silva

COVID-19 has a tremendous impact on food systems globally that lead to serious risk of food insecurity. Rich and poor countries have been experiencing the consequences of the political failures in food systems under the COVID circumstances. However, the poorest countries are the ones who is paying the greatest price.

Children around the world are facing serious problems related not only to the shameful undernourishment and hunger but also obesity that grow with children and put them under the stress of diabetes, heart disease and some cancers etc.

Forty one thousand people have taken part in the United Nations (UN) Food Systems Summit that took place on 23 September 2021 to develop equitable, healthy and sustainable responses under the motto "no one is left behind" as we "build back better" from COVID-19.

To read more about the outcomes of the summit, Please click here: http://www.ipsnews.net/2021/09/fundamental-changes-needed-un-summit-tackle-global-food-insecurity/

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FAO report on convert food systems towards more food security, improved nutrition and affordable healthy diets for all people

https://www.fao.org/documents/card/en/c/cb4474en

Release date: 2021

By: FAO, IFAD, UNICEF, WFP and WHO / https://www.fao.org/documents/card/en/c/cb4474en

In recent years, huge efforts have been spent towards reducing and ending the issues of world hunger and malnutrition in all its forms by 2030. However, under the COVID-19 pandemic, the challenges have grown.

This report presents the first global assessment of food insecurity and malnutrition for 2020. Moreover, it suggests possible indications of how the issue of global hunger might look like by 2030 in a scenario further complicated by the enduring effects of the COVID-19 pandemic.
The report offers estimation of the cost and affordability of healthy diets, which provide an important link between the food security and nutrition indicators and the analysis of their trends. Altogether, the report highlights the need for a deeper reflection on how to better address the global food security and nutrition situation.

Please click here to read the full report: https://www.fao.org/3/cb4474en/cb4474en.pdf

More information: https://www.fao.org/documents/card/en/c/cb4474en

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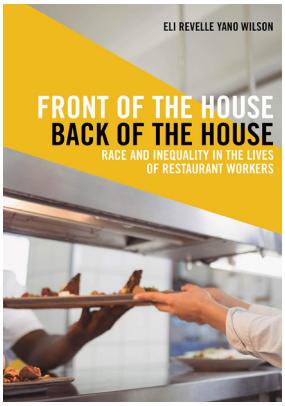

Front of the House, Back of the House: Race and Inequality in the Lives of Restaurant Workers

A review by Brittney Biggs

Authors (Eds.): Eli Revelle Yano Wilson
Publisher: New York University Press.
Published year: 2021
Language: English
ISBN: 978-1479800612
Length: 223 pages

Sociologist Eli Revelle Yano Wilson's intriguing book, *Front of the House, Back of the House: Race and Inequality in the Lives of Restaurant Workers,* contrasts front-of-the-house and back-of-the-house workers at three Los Angeles restaurants of varying dining quality. Wilson chose to feature the three restaurants because his employment at each one gave him access to observe, interact, and analyze the inner workings of the restaurants. Those working in the front tend to be white, from somewhat affluent backgrounds with families likely to help them in times of financial stress, and college-educated. Those working in the back tend to be immigrants or grown children of immigrant parents, Spanish-speaking, and more financially dependent on their jobs than their white counterparts due to their tendency to have fewer family financial resources to fall back on. Drawing on his experience working in these kitchens as a participant observer, as well as interviews with his fellow workers, Wilson characterizes the interactions, and lack thereof, between the two groups, while identifying key factors of dissimilarity such as hiring processes, wage and tip differentiation, workers' physical attractiveness, their outside hobbies, and their social lives.

Eli Revelle Yano Wilson writes in a clear, engaging, and thorough manner in order to help the reader arrive at a better understanding of the disproportionate realities present in the dichotomous cultures of restaurant workers. The book is structured by introducing the three restaurants individually, then intermingling stories from each to elaborate on the workers' experiences of racial disparities within the workplace. Throughout the book, Wilson illustrates how those in the front of the house enjoy greater flexibility and mobility than those in the back, and he concludes by stating how the racial division is created and maintained by restaurant managers seeking hirees with desired traits that are socially ascribed rather than achieved. The desirable socially ascribed traits include physical attractiveness, friendliness with customers, and wittiness. Understanding the racial divides in this considerably small sector of society may help readers better grasp racial divides in society as a whole. The ethnographic, story-telling approach of the book incorporates several "characters," or employees, whom Wilson worked with, making the tone of the writing alive, vibrant, and relatable. The goal of the book, to analyze the social environments of restaurant employees, is accomplished effortlessly, as Wilson writes from personal experience and through observations of interpersonal interactions around him. Wilson's work is important for understanding racial disparities not only in the food labor force, but in broader U.S. society as well.

For the many readers who have worked in food service, it will be easy to identify with the cultural dynamics described in the book. Certainly, these ideal types are evident in most restaurant scenes. However, the study's setting in Los Angeles may be a determinant of the racial composition of employees. While Wilson's description of the stark divide between primarily white front-of-the-house workers and primarily Hispanic back-of-the-house workers is valuable for highlighting predominant inequalities, the workforce in many restaurants around the country features greater racial and cultural diversity than described within the book. Nonetheless, Wilson's analysis remains a valuable contribution for better understanding of the disparities faced by restaurant workers, regardless of racial or ethnic composition. Furthermore, Wilson's analysis is applicable to the broader dynamics of food system labor. Just like in the back-of-the-house restaurant context, farmers, specifically immigrant farmers, are more susceptible to financial turmoil, unsuitable working conditions, and isolation from the food products they are crucial to help bring forth. Racial and class inequalities

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are present in every realm of food production.

Overall, Wilson provides a valuable, first-hand insight into the lives of restaurant workers and how their experiences differ based on race and ethnicity. The book is well-organized, accessible, informative, and potentially a catalyst for social change. Wilson brings awareness to the realities facing restaurant workers in a raw, personal way that emphasizes a systemic perception of labor inequalities. Though a scholarly book, the writing is so accessible that it will appeal to general as well as academic readers. This book would be of interest to scholars, as well as a valuable text for undergraduate and graduate courses in food studies, sociology, and ethnic studies, or for anyone seeking to expand their understanding of the class and race inequalities in food labor.

About the author:

Brittney Biggs is a graduate student in sociology at Portland State University in Portland, Oregon, United States. Her academic focus is on marginalized communities, encompassing intersectionality and disproportionate societal impacts.

CALL FOR PAPERS

Vol. 10, Number 1 2022

THE FUTURE OF FOOD JOURNAL
JOURNAL ON FOOD, AGRICULTURE & SOCIETY

Climate-smart agriculture

Scope:

Climate-smart agriculture involves farming practices that improve farm productivity and profitability, help farmers adapt to the negative effects of climate change, and mitigate climate change effects, e.g., by soil carbon sequestration or reductions in greenhouse gas emissions. It is a pathway towards development and food security built on three pillars: increasing productivity and incomes, enhancing the resilience of livelihoods and ecosystems, and reducing and removing greenhouse gas emissions from the atmosphere. Climate-smart practices include practices with an explicit focus on adaptation and practices with a broader scope on reducing production risks and reducing emissions.

The proposed issues will focus on climate-smart approaches that include, but not limited to, increasing diversity, improving sustainable soil and land management, increasing energy use efficiency, and promoting sustainable mechanization.

Publication time: this issue is planned to be published during the **1st quarter of 2022**

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Vol. 10, Number 2 2022

THE FUTURE OF FOOD JOURNAL
JOURNAL ON FOOD, AGRICULTURE & SOCIETY

Agro-based Bioeconomy

Scope:

The bioeconomy is defined as the production, utilization, conservation, and regeneration of biological resources. It is an economic sector primarily based on biogenic instead of fossil resources, and which is increasingly prevalent in policymaking across the globe. Agriculture is one of the essential fields of bioeconomy as it brings together various sectors of food systems, including agriculture, forestry, fisheries , and aquaculture, as well as food and feed manufacturing occupy the biggest niche of the bioeconomy.
The proposed issue will focus on topics that include, but not limited to, the integrated approach for sustained innovation in various areas of agro-based bioeconomy, production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy, agriculture, forestry, fisheries, food production, as well as parts of chemical, biotechnological and energy industries.

Publication time: this issue is planned to be published during the **2nd quarter of 2022**

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Vol. 10, Number 3 2022

THE FUTURE OF FOOD JOURNAL
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Marketing and consumers behaviour

Scope:

Consumers' behaviour has been the core of attention of researchers in food marketing. The power of companies economy is built on their ability to sell products and services and understand consumers' motivations to purchase products and services. However, consumers differ in their purchase motivations, susceptibility to marketing attempts, and decision-making strategies. Much research nowadays ignores this fact.

Studying consumer behaviour is essential for marketers to understand what influences consumers' buying decisions and final choices. By understanding how consumers decide on a product, they can fill in the gap in the market and identify the products that are needed and the products that are obsolete.

The proposed issue will focus on topics that include, but not limited to, how people make decisions about what they buy, want, need, or act in regards to food or agricultural products or services, factors that affect consumers' behaviour ', including psychological, personal and social factors, behaviour of consumers while researching and shopping, the influence of the environment on consumer behaviour, how marketing campaigns can be adapted and improved to more effectively influence the consumer.

Publication time: this issue is planned to be published during the **3rd quarter of 2022**

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CALL FOR PAPERS

Vol. 10, Number 4 2022

THE FUTURE OF FOOD JOURNAL
JOURNAL ON FOOD, AGRICULTURE & SOCIETY

Sustainable nutrition systems

Scope:

A sustainable nutrition system is a key to reforming our global food system. As studies and statistical projections have shown, in 2050, the world population is estimated to reach approximately 9.8 billion people, and therefore the question is always: How can we feed them all? Our current diet will not answer the previous question. The current diet depends largely on increasing production, ignoring all other factors. Whereas, we must rethink the method of cultivation used, the amount of production, distribution, and household consumption.

The proposed issue will focus on topics that include, but not limited to, promote an effective, sustainable nutrition system that reduces environmental impacts, confronts the environmental challenges, and improves health and nutritional outcomes, and helps produce nutrient-rich foods

Publication time: this issue is planned to be published during the **4th quarter of 2022**

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Thank you Reviewers

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FOFJ appreciates the efforts and experience of all its highly qualified reviewers who contribute to the science and quality of research. Therefore, FOFJ thanks all the reviewers who dedicate time, knowledge, and effort to improve the quality of submitted manuscripts.
In this issue, FOFJ would like to extend a sincere Thanks to our reviewers **Dr. Bárbara Franco Lucas, Dr. Vladimir Divic, Dr. Hussam Hussein, Dr. Morena Galesic and Dr. Diana Hmaidosh** for their contribution in reviewing articles for Vol 9. As FOFJ launches a new Call of Reviewers, we hope to continue working with experienced academics to provide the best for our readers and authors.

Dr. Bárbara Franco Lucas is a Food Engineer with a Master's degree and Ph.D. in Engineering and Food Science. She is a researcher at the Federal University of Rio Grande in the fields of food engineering, food science, and consumer behavior.

She developed part of her Thesis at Bern University of Applied Sciences, Switzerland. She has a background in microalgae cultivation, drying methods, extrusion process, food development, sensory evaluation, and consumer behavior.

Dr. Vladimir Divic is an assistant professor at the Faculty of Civil Engineering, Architecture and Geodesy, University of Split, Croatia. As a Head of Laboratory, his research interests cover different areas of civil engineering, emphasizing sustainability and application of open-source electronics in various laboratory and field measurements.

In addition, he has actively participated in local strategies covering climate actions (SDG13) and sustainable urbanism (SDG11). Besides structural testing, his measurement systems have been applied in research related to water resources, soil quality and climate risks.

Thank you Reviewers

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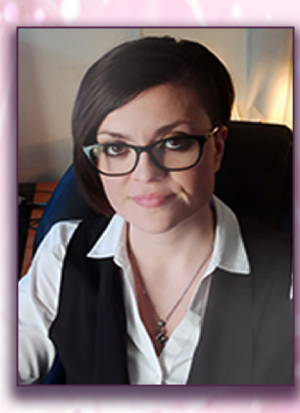
Dr. Hussam Hussein is political scientist with a strong research interest in water and environmental policies, and a geographical focus on the Middle East and North Africa (MENA).

He is currently a Departmental Lecturer and Oxford Martin Fellow in International Relations at the Department of Politics and International Relations (DPIR) at the University of Oxford, member of the Middle East Centre (St. Anthony's College), and Fulford Junior Research Fellow at Somerville College, University of Oxford. During his PhD degree at the University of East Anglia, he investigated the discourse of water scarcity in the case of Jordan and its impacts on transboundary water governance.

During a research fellowship at the American University of Beirut, he investigated hydropolitics in the Levant and the role of refugees on water governance in the case of Lebanon and Jordan. Moreover, he adopted holistic approaches for the study of the water-energy-food nexus in the case of the MENA while working as a Research Associate at the Section of International Agricultural Policy and Environmental Governance, University of Kassel. His research focuses on the role of discourses in shaping water policies in the Middle East, on transboundary water governance and critical hydropolitics, and on issues related to the political economy of water resources in arid and semi-arid regions. His teaching experience include lectures, tutorials, and seminars in International Relations, Water Policy, and International Agricultural Policy. Before his PhD studies, he obtained a BA and MA in International Relations and Diplomacy from the University of Trieste – Gorizia (Italy), studied Middle Eastern Studies at SOAS, University of London, and obtained an MA in Interdisciplinary European Studies from the College of Europe.

He also worked for the Italian Embassy in Amman, Jordan, the European Parliament, and for the International Finance Corporation – World Bank, and as an international consultant for UNICEF and for BGR.



Dr. Morena Galesic is a researcher in water resources management and water pollution risk assessment at the University of Split, Croatia.

She has a background in civil engineering, including bachelor, master, and doctoral degrees, with an inclination to water resources and sustainability. During her research, she has been actively working on pollution transport problems by engaging analytical and numerical modelling, field measurements in river estuaries, and stakeholder workshops.

She is currently working on two major projects (STIM-REI, a project at the Center of Excellence for Science and Technology Integration of Mediterranean Region (STIM), connects research (R), innovation (I) and education (E), and Development of technology for assessment of autopurification capabilities of coastal waters - Coastal Autopurification Assessment Technology (CAAT)) focused on coastal waters, corresponding environment, and sustainability under growing pressure from climate change. As a part of a diverse team in charge of the Development strategy of the city of Split until 2030, she is coordinating and working in the fields of waste management and management of natural risks and climate change.

Morena is active at teaching in related subjects (water resources management, coastal engineering); she was also a participant at the UNLEASH Innovation lab organized by United Nations in June 2018 in Singapore, and worked as a facilitator at Mini-Unleash lab in December 2018 for University of Kassel.

Thank you Reviewers

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Dr. Diana Hmaidosh is a researcher with a strong knowledge of medicinal and aromatic plants and bio accumulators. She gained extensive experience in medical drug laboratory during her work in the laboratories of the Faculty of Pharmacy in both Tishreen university and Andalus Private Medical University, Syria.

She is an academic teacher and supervisor and has supervised several undergraduates, graduate and postgraduate students in the Faculty of Agriculture and Pharmacy at Tishreen University, Syria.
Currently, she works in the Department of Biodiversity- Cedar & Fir reserve, Ministry of Agriculture, Syria. Before that, she worked as a member of the National Environmental Observatory Project in the Ministry of Local Administration and Environment, where she obtained ten years of rich practical experience in GIS.

Dr. Hmaidosh obtained her Ph.D. degree from Tishreen University. During her studies, she conducted chemical experiments at the laboratories of the Agricultural faculty of Basra University, Iraq.
Her work and results were presented in many national and international scientific conferences. Before her Ph.D. studies, she obtained a BA and MA in Ecological science from Tishreen University, Syria.
Throughout her academic years, Dr. Hmaidosh has published several scientific papers.