Analysis of the Subjective Economic Welfare and Well-Being of Pyrethrum Farmers in Makete District; Tanzania

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Abstract

This *paper made an analysis of the subjective economic welfare and well-being of pyrethrum farmers in Makete District; Tanzania*. The study employed a quantitative approach and a cross-sectional study design was opted. The Leyden approach was employed to analyze farmers' subjective economic welfare by posing the empirical basis of the Income Evaluation Question (IEQ) developed by Van Praag (1971). The result for the want parameter (a proxy of welfare function) was 13.9537 ($I=e^u$, $I=e^{13.937}$). The exponent of want parameter represented the average income an individual was considered insufficient (Tshs. 1,148,193/- per annum). The result implies that farmers needed an annual total average income of more than Tshs. 1,148,193/- for satisfying their needs or wants. This amount is less than the annual minimum wage of Tshs. 1,200,000/- (URT, 2013a). Satisfaction with life as a whole question was also employed to evaluate subjective well-being using descriptive analysis. Results show that: 57.7% and 4.1% of farmers were satisfied and very satisfied respectively with the way they lived after starting selling pyrethrum. On marketing factors, however, results reflected high dissatisfaction levels. This study recommends that agricultural produce and marketing policies for rural pyrethrum farmers should be considered in a multidimensional strategy in a move to improving the subjective economic welfare and well-being of pyrethrum farmers in Makete district.

Keywords: The Leyden Approach, Subjective Economic Welfare, Well-being, Pyrethrum marketing

1. Introduction

Pyrethrum production is the major economic activity in Makete district. It constitutes to about 99.9% of cash crops. In the year 2010/2011 pyrethrum contributed most of the revenue at a total of Tsh.109, 171,500 (MDC Socio-economic profile, 2011). However, economic welfare and well-being of pyrethrum farmers is considered low (MDC, Socio-economic profile, 2011). This fact was supported by the outcome results of the Household Population Index Survey of the year 2009 which showed that the per capita income in the district was Tshs. 200,000/- and the Gini Coefficient rate of 32 percent marked Makete district as having the worst uneven distribution of wealth in the Njombe region. The regional Gini Coefficient rate was 43 (NBS, 2013).

The marketing of agricultural produce at rural primary marketing level is a vital economic activity within the output phase (United Republic of Tanzania, 2011). It is marketing which guarantees their produce to generate income which in turn would determine economic welfare and well-being of farm households. Pyrethrum farmers in some countries of the world and East Africa like Tanzania, face severe pyrethrum marketing constraints towards accessing marketing factors for effective and efficient marketing activities at primary marketing level (URT, 2011). This situation leads to rural income deficiency which leads to the decline of the economic welfare and well-being of pyrethrum farmers in the country (URT, 2011). This paper therefore, wanted to investigate the extent the economic welfare and well-being of pyrethrum farmers in Makete district have been affected. The analysis was done by employing the Leyden Approach

The Leyden approach is a Dutch tradition of studying subjective welfare in connection with the economic circumstances of the household, e.g., income, family composition, age and employment (Van Prang and Ferrer-i-Carbonell, 2004). Within this research tradition the Leyden approach measures of subjective poverty lines and income evaluation have been developed. The Leyden approach is mainly empirical and data-oriented. It focuses on evaluation of income, utility of income, income satisfaction, that is, economic welfare and well-being. In this study we might, in some cases, drop the adjective "economic", but when the term "welfare" was used, we meant welfare derived from income. The Leyden approach is based on the assumptions that individuals are able to evaluate income levels in general and their own income in particular. In the context of this paper, such terms as "very insufficient", "insufficient", "sufficient", et cetera were used. We call these terms; "verbal qualifiers" which are translated into the Individual Welfare Function of Income (WFI) (Van Praag, 1971). They describe how a farmer could have evaluated different income levels, under the basis of Income Evaluation Question, (IEQ) to measure subjective economic welfare.

The empirical findings based on subjective questions of welfare and well-being, are all from developed countries in the "western" literature. There exists no literature in Tanzania except one of Dimoso (2009) which looks at the household subjective welfare and well-being in the Leyden approach. It is because of this non-existence of local literature that motivated this study use, with adaptations, the "western" structure of individual well-being and welfare in the Leyden Approach structure. The phrase "with adaptations" suggests that while the structure and methodology of analysis remain the same, determinants of subjective welfare and subjective well-being would either be added, or deducted, or redefined to fit the local context.

2. Theoretical Perspectives and a Brief Review of Empirical Studies

There are two concepts in this study; namely *welfare* and *well-being*. The former stands for the narrow concept of satisfaction derived from income or *monetary* welfare. The latter concept is a much wider concept; it stands for satisfaction with life as a whole. Figure 1 shows how these two concepts fit together. In a mathematical language, welfare is a subset of well-being while well-being is a full set. Figure 1 introduces also another concept, that is, *standard of living*. The

standard of living refers to material issues only (*material welfare*), such as income, wealth and goods (Antonides and Raaij, 1998). As such, in mathematical language, standard of living is a subset of welfare. This study considers mainly the *welfare* and *well-being* concepts in its analysis.

Source: Antonides and Raaij (1998).

Figure 1: Standard of living, welfare and well-being concepts

In the Leyden approach; subjective economic welfare is considered to be known as income satisfaction (Van Praag, 1971). This approach speaks of utility of income. The income concept considered here is the after-tax (disposable Income) annual household income (Van Praag, 1971). The Individual welfare function is considered as the need parameter (symbolized by μ) and denoted by the log income that was evaluated at 0.5 on the [0.1] welfare scale. Individual welfare function varies with need parameter μ and parameter sensitivity σ which is the sensitivity parameter of the welfare function (Van Praag, 1968). In the context of this study, for each respondent, three income levels were connected to three utility levels. The shape of the welfare function can be inferred from these three combinations. Many functions can be fitted using these three points. However, in Van Praag (1968), it was argued on theoretical reasons, that it would be a lognormal distribution function. The reason of this study to use a distribution function is that, we assumed roundedness of the utility function, there is a worst and a best position in terms of welfare (satisfaction). Main contributors of Leyden approach were Van Praag, Kapteyn, Wansbeek, Hagenaars, Van der Sar, Plug, and Frijters.

This argument on theoretical reasons in Van Praag (1968) on lognormal distribution function is supported by Van Herwaarden & Kapteyn (1981) who showed that the points of the welfare function found empirically, best fitted a lognormal curve within the class of distribution functions. A welfare function is considered to be concave but not for all income levels; for low incomes a welfare function takes a convex shape (Van Praag, 1991). In economics, it is conventional wisdom, that utility function of income is always concave. This is called a Law of Decreasing Marginal Utility, also known as Gossen's first law (Van Praag, 1991). But scientific experiments with insurance or gambling behavior show this is not always true; it thus follows that a utility function may be convex in certain regions (Kahneman, 1991).

On the other hand, following the Leyden Approach, subjective well-being was measured using a satisfaction-with-life question developed by Gurin et al. (1960) (See details in Section 3.3.).

3. Materials and Methods

This paper employed cross-sectional study design and quantitative approach in data analysis. The main type of data was primary. Sources of data were farm household heads (units of analysis). Primary data was collected in the year 2014 from Southern highlands, in Makete district, Njombe region, Tanzania. This study was conducted in Makete district, where its people depend on pyrethrum crop as the main traditional cash crop for their livelihoods. Most

farm household heads (pyrethrum farmers) are believed to derive their economic welfare and well-being from pyrethrum sales' income. Research survey was conducted in Ivilikinga, Isapulano, Ibaga, Kidope, Makwaranga, Matenga, Kinyika, Igumbilo and Ludilu the pyrethrum growing villages among others. The study area has the volcanic soils due to the past volcano explosions in Livingstone Mountains; with the altitude of between 1500 to 3000 meters above sea level and this makes the area to experience temperate climatic conditions with low temperatures ranging from 2^o Centigrade to 20^o Centigrade in the highlands are suitable and conducive for growing pyrethrum. In lowlands with temperatures, 20^o Centigrade to 30^o Centigrade, pyrethrum flowers are not grown.

3.1 Descriptive Analysis

This paper employed a variety of measures of central tendency dispersion which include: frequencies, percentages, means and standard deviations to describe the properties of Units of Analysis. The results of pyrethrum farmers' characteristics, subjective welfare, subjective well-being and marketing factors are presented in Tables and Figures.

3.2 Individual Welfare Function of Income

Individual Welfare Function of Income (WFI) is an operationalized version of the cardinal utility function of income. Individual Welfare Function of Income (WFI), describes how a pyrethrum farm household head evaluated different income levels and need parameter (a proxy of welfare function) was estimated by posing the Income Evaluation Question, (IEQ). The income evaluation question was given as:-

"Which yearly household disposable income would you consider being very insufficient, insufficient and sufficient?"

Satisfaction level	Amount in Tanzanian Shillings
Very insufficient	
Insufficient	
Sufficient	

The three IEQ answers of pyrethrum farm households head i are denoted by q_{ij} . The individual welfare function is of the form:

$$\mu(I) = \Lambda(I; \mu_i, \sigma) = N(\ln I; \mu_i, \sigma) \quad (i = 1, \dots, N) \quad (1)$$

Where: Λ represents the log-normal function and N represents the normal distribution function. The individual welfare function varies with μ and σ is estimated in the form shown:

$$\mu_i = \frac{I}{J \sum_{j=1}^J \ln(q_{ij})} \quad i = 1, \dots, N; j = 1, 2, 3 \quad (2)$$

$$\sigma_i = \sqrt{\frac{I}{(J-1) \sum_{j=1}^J (\ln q_{ij} - \mu)^2}} \quad (3)$$

Where: μ is the need or want parameter of the individual welfare function and it denotes the log-income that was evaluated at 0.5 on the $[0,1]$ welfare scale. μ determines the position of utility with respect to the income. However, if μ increases, the individual becomes less satisfied with the same amount of income, that is $U(I; \mu)$ is decreasing in μ . σ is the sensitivity parameter of the welfare function which defines the slope of the welfare function (Van Praag, 1968). If $\sigma = 0$ it is a limiting case where individuals are completely unsatisfied with any income until their income reaches e^μ , and where they are completely satisfied if their income exceeds e^μ . And q_{ij} stands for the three income levels (q_1, q_2, q_3) these were reported in the IEQ by a pyrethrum farm household i . For us to succeed in using the IEQ for welfare comparisons, we made the assumption that all pyrethrum farm households in the language community attach the same verbal label and to the same welfare level.

3.3 Subjective Well-Being

The Gurin-question asked in the survey was:

"Taking everything into account, how satisfied are you these days? Choose one response."

<i>Very dissatisfied</i>	1	
<i>Dissatisfied</i>	2	
<i>Satisfied</i>	3	

The answers obtained, denoted by v_i , are numbers on a (1,3) scale, where 1 stands for very dissatisfied, 2 stands for dissatisfied and 3 stands for satisfied. The answer to this question was taken as a proxy of an individual's subjective well-being (see Frey and Stutzer, 2002b; Luttmer, 2005). Individual answers were then explained as per the hereunder model:

$$SWB_i^* = \alpha + \beta X_{ki} + \varepsilon$$

$$SWB_i = v \leftrightarrow \pi_v \leq SWB_i^* < \pi_{v+1}$$

Where SWB is the abbreviation for Subjective Well-Being. SWB is the answer to the satisfaction question, SWB^* is an unobserved latent variable, i represents the individual, v are the three discrete categories (1 to 3), π_v are two estimated intercept terms also known as "threshold parameters", X_k is a set of k explanatory variables, and ε represents the usual error term. Firstly, SWB^* is a categorical variable and thus we cannot observe the exact level of satisfaction but only its range. Secondly, the answer to the subjective well-being question provides an ordinal (and not cardinal) ranking. Thirdly, ordinal interpersonal comparability is

assumed. This means, for example, that an individual answering “3” is more satisfied or happier than one answering “1”, but not necessarily three times as happy or satisfied (Ferrer-i-Carbonell and Frijters, 2004). The ordered probit model with three alternatives could be used to run the hereunder model.

$$SWB_i = \begin{cases} 1 & \text{if } SWB_i^* < \pi_v \\ 2 & \text{if } \pi_v \leq SWB_i^* < \pi_{v+1} \\ 3 & \text{if } \pi_{v+1} \leq SWB_i^* \end{cases}$$

Where $\pi_v < \pi_{v+1}$.

This is because the alternatives are hierarchical ranging from negative to positive. This paper, however, didn't go that far. The results herein inscribed are thus merely descriptive.

4. Results

Results of evaluates from descriptive analysis are presented in Table 1. Results show that the minimum age of pyrethrum farm household heads interrogated in the survey was 19 years and the maximum was 88 years. Mean age of pyrethrum farm household heads was 46.85 years with a standard deviation of 13.762 years. The results indicate that age distribution of heads of households was highly dispersed between 19 and 88 years. Empirically the normal distribution rule states that 68% of the observation falls within 1α (1 times the standard deviation). This is in accord to Wheeler & Chambers (1992). Based on this theory, 68% of pyrethrum farm household heads were in the age between 33 years and 61 years. This supplicates a suggestion that more than 68% of pyrethrum farm household heads were of the working-age which is 15 years to 64 years (NBS, 2013).

Table1 Descriptive statistics results

Variable	No. of observations	Minimum	Maximum	Mean	Std. Deviation
Age of the household head	267	19	88	46.85	13.762
Number of household members	267	1	8	4.10	1.636
Total size of land owned by household in acres	267	.50	10.00	2.1105	1.61057
Household pyrethrum sales in kilograms	267	13	5500	418.69	706.098
Total household pyrethrum income obtained from first and previous season selling	267	16600	9150000	720097.94	1215762.833
Yearly average income received by household from other sources of income by each household member	267	40000	9060000	897471.16	1150660.854
Yearly average income in Tanzania shillings	267	88700	10300000	1600236.89	1795162.280

Which yearly household disposable income would you consider to be Very dissatisfied	267	180000	8430000	1325059.93	1353363.639
Which yearly household disposable income would you consider to be dissatisfied	267	300000	10050000	1597640.45	1559237.467
Which yearly household disposable income would you consider to be satisfied	267	390000	12480000	1868200.37	1795948.120
Want parameter	267	12.62	16.14	13.9537	.75337
Sensitivity parameter	267	.05	.56	.2144	.09192
Valid N (list wise)	267				

Source: Computed from field data

In Figure 1 results show that on the sex of pyrethrum farm household heads, 18% of household heads who participated in the study were female and the remaining 82% were male. The results indicated that the majority of household heads in the study area were male and few households were headed by a female. Importance of gender in this study was to unveil if this difference in heading households (either by male or female) had any influence on household head's subjective economic welfare and subjective well-being.

Figure 1 Sex of household heads.

Figure 2 shows results on education of farm household heads. The results show that 11.6% were illiterate (had not gone to school), 76.8% had a maximum of primary education, 10.9% had a maximum of secondary education, 0.4% had a maximum education of vocational training and the remaining 0.4% had education at university level. These results indicate that the majority of pyrethrum farm household heads in the study area had primary education compared to other education levels.

Figure 2 Education of household heads

Figure 3 shows results on the occupation of household heads. The results show that 91% of pyrethrum farm household heads were farmers; 3.4% were government employees, 1.9% were private-sector employees, 3% were retired and 0.7% were businessmen or women. This means that the majority of household heads who took part in the study were farmers who never worked as employees elsewhere. The fact that some of the pyrethrum farm household heads were also businessmen or women, retired and employees; this would reveal their subjective economic welfare and well-being differences compared to those who are only pyrethrum farmers.

Figure 3 Occupation of households' heads

In Table 2 results show that the minimum number of farm household members was 1 and the maximum number was 8. The mean was observed to be 4.1 with a standard deviation of 1.636. The results imply that on average the household size was 4 individuals per farm household. The standard deviation of 1.636 indicates that pyrethrum farm households were experiencing varying household size which in turn would differently influence their wants. The average household size of 4.1 individuals per household was below that of Rural Tanzania Mainland which is 5 individuals per household, but equal to that of the Njombe region which is 4.1 individuals per household (URT, 2014).

The essence of having a larger household size of up to a maximum of 8 household members can be linked to pyrethrum farm household heads' satisfaction with cheap labour from household members especially for pyrethrum harvesting which is normally done on weekly basis after first blossoms. In Table 1 results show that the minimum farm size was 0.5 acres while the maximum was 10 acres. The mean was 2.1105 acres with a standard deviation of 1.61057. Since the standard deviation was relatively small it indicates that majority of pyrethrum farm household heads owned an average of 2 acres of land for their pyrethrum farming and few pyrethrum farm household heads had big farm size of up to 10 acres. In accordance with TPB (2011) 1 acre has a potential of producing up to 1000 kilograms of pyrethrum dried flowers.

In this situation the results imply that pyrethrum farm households in the study area had a potential of harvesting an average of up to 2000 kilograms of pyrethrum in an acre. In Table 1 results show pyrethrum farm households were likely to harvest between the minimum of 13 kilograms and the maximum of 5,500 kilograms of pyrethrum dried flowers. The mean harvest was 418.69 kilograms with a standard deviation of 706. The huge standard deviation indicates that pyrethrum harvests were highly varying among pyrethrum farm households. Moreover, the fact that on averages the farm size was 2 acres reveals that on average pyrethrum farm households were harvesting about 209.35 kilograms per acre which is less than the potential of 1000 kilograms per acre yearly (TPB, 2014).

This finding shows there is still more than enough opportunity among pyrethrum farm households in the study area to utilize resources and maximize production, resulting to great sales of pyrethrum dried flowers which in turn would inevitably improve their economic welfare and well-being. Also, in Table 1 results show that pyrethrum farm households in the study area were earning a minimum of Tshs. 16,600/- and the maximum of Tshs. 9,150,000/- from pyrethrum sales. The mean income earned by pyrethrum farm households from pyrethrum sales was Tshs. 720,097.94/- with a standard deviation of Tshs. 1,215,762.83/-. The huge standard deviation indicates that pyrethrum farm households were exhibiting varying degrees of annual pyrethrum sales income levels between the minimum which was Tshs. 16,600/- and the maximum which was Tshs. 9,150,000/-. The fact that an average income earned by pyrethrum farm households from pyrethrum sales was about 50% of the total annual average income, one can suggest that pyrethrum is the main source of income in the study area. The observation reflects the general consideration that 75.9% of rural populations depend on agriculture as the main source of income (URT, 2013b).

It is therefore empirically evident that the influence of income on pyrethrum farm household heads' subjective economic welfare and subjective well-being is largely derived from pyrethrum as a source of income in the study area. In Table 2 results show that, pyrethrum farm household heads in the study area, were earning a minimum of Tshs. 40,000/- and the maximum of Tshs. 9,060,000/- from other sources. The mean income earned from other sources was Tshs. 897,471.16/- with a standard deviation of Tshs. 1,150,660.85/-. The huge standard deviation indicates that pyrethrum farm households were exhibiting varying degrees of annual income levels from other sources between the minimum which was Tshs. 40,000/- and the maximum which was Tshs. 9,060,000/-. It was thus observed that other sources of income apart from pyrethrum sales constituted about 50% of the total annual average household income. Table 2 shows other main sources of income with their percentages in brackets. These are food crop cultivation (76%), poultry and livestock keeping (12%), wood cultivation (3%), small businesses (0.7%), employment (5.2%) and remittances (3%). These results were not shocking, since were reflecting the occupation distribution of pyrethrum farm household heads as observed earlier where the majority were farmers and few were small businessmen and businesswomen or employees. Results show that, all these activities had a collective contribution of about 50% of the annual average household income implying that having more than one source of income is of importance for both economic welfare and well-being improvement among pyrethrum farm households. This is based on the fact that unlike pyrethrum sales, other sources of income are less seasonal and can even finance necessary inputs for pyrethrum cultivation.

Table 2 Households' other source of income

What are the major other sources of household income	Frequency	Percent	Valid Percent	Cumulative Percent
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Valid	Food crop cultivation	203	76.0	76.0	76.0
	Poultry and livestock keeping	32	12.0	12.0	88.0
	Wood cultivation	8	3.0	3.0	91.0
	Small businesses	2	.7	.7	91.8
	Employment	14	5.2	5.2	97.0
	Remittances and pension	8	3.0	3.0	100.0
	Total	267	100.0	100.0	

Source: Computed from field data.

In Table 1 results show that the minimum annual household income was Tshs. 88,700/- and the maximum was Tshs. 10,300,000/-. The mean annual household income was Tshs. 1,600,237/- with a standard deviation of Tshs. 1,795,162/-. The huge standard deviation indicates that pyrethrum farm households were exhibiting varying degrees of annual income levels between the minimum which was Tshs. 88,700/- and maximum which was Tshs. 10,300,000/-. The annual total average income exceeds the lower minimum wage of Tshs. 1,200,000/- as determined by the government minimum wage policy (URT, 2013a). This reflects the fact that pyrethrum farm households' heads were earning income above the minimum wage which is considered enough for subsistence.

Figure 4 Access to agricultural extension services.

Extension services in agriculture are meant for agricultural modernization and technical service provision to farmers (NIFA, 2015). In Figure 4, the results show that 68.2% were accessing agricultural extension services from village extension officers, 29.6% were accessing agricultural extension services from ward extension officers and the remaining 2.2% were accessing agricultural extension services from other non-formal sources like friends and colleague farmers. These results reveal a varying degree of access to extension services among pyrethrum farm households in Makete district. While some have extension services readily available as close to the village level, others must find the same services as far as the ward offices away from their localities. 2.2% of other pyrethrum farm households fail to obtain extension services from trained personnel but depend on non-formal sources like friends and colleague farmers.

4.2 Marketing Factors

Figure 5 shows that 80.9% of pyrethrum farmers were very dissatisfied with non-technological drying facilities, 16.1% were dissatisfied and the remaining 3% were uncertain.

Figure 5 Marketing factors

These results indicate that pyrethrum farm households were experiencing difficulties tied with the use of non-technological facilities in drying their pyrethrum harvests. The results were in line with pyrethrum farmers' complaints on lack of such facilities coupled with difficulties associated with drying pyrethrum during rainy seasons. Lack of technological drying facilities is normally associated with both quantity and quality of pyrethrum dried flowers for marketing. The situation stimulates rural income deficiency and the decline of the economic welfare and well-being of pyrethrum farmers in the country (PIDTF, 2011). Figure 5 further shows that 73% of farmers were very dissatisfied with rural farm transport, 20.6% were dissatisfied and the remaining 6% were uncertain. These results imply that pyrethrum farmers were using local transportation mechanisms which made them very dissatisfied as portrayed by the types of transport in Table 3, where results show that 0.4% were using cattle for rural farm transport, 37.1% were using donkey, 6.7% were using bicycles, 48.7% carried on their heads and 7.1% used locally made trucks. These results reveal that the majority of farmers were carrying raw pyrethrum flowers on their heads. This can also be associated with a number of challenges like quality and bulkiness of harvested raw pyrethrum flowers, especially during rainy seasons. The results concur with Mathur (1971) who asserted that, the transportation of harvested agriculture products from farm households' small scale farms to households becomes bulky and sometimes it is impossible all together to transport, particularly during rainy season when most farm roads are impassable.

Table 3 Local rural farm transport

How do you transport pyrethrum from farm to household	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Cattle	1	.4	.4	.4
Donkey	99	37.1	37.1	37.5
Bicycle	18	6.7	6.7	44.2
On head	130	48.7	48.7	92.9
Local truck	19	7.1	7.1	100.0
Total	267	100.0	100.0	

Source: Computed from field data.

Marketing information is very important for making informed decisions which are more likely to facilitate access to good markets and competitive higher prices (Marocchino, 2009) and it is through marketing information that pyrethrum farmers can get to know market dynamics and decide on how much to produce. From Figure 5 the results show that, 79.8% of pyrethrum farmers were very dissatisfied with marketing information, 16.5% were dissatisfied, 3.4% were uncertain and the remaining 0.4% were satisfied. This was based on the fact that there was limited formal way of getting marketing information as presented in Table 4 where results show that 25.1% of farmers got marketing information from their friends, 28.8% get marketing information from pyrethrum buyer vendors, 5.2% get marketing information from ward executive officers (WEOs), 7.5% get marketing information from village executive officers (VEOs) and 33.3% get marketing information from village pyrethrum selling agents. These results imply that pyrethrum farmers get market information from price setters, like pyrethrum buying agents (PCT Ltd) while advocates like WEOs and VEOs play a little role on the same.

Table 4 Source of market information

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Friend	67	25.1	25.1	25.1
Buyer vendors	77	28.8	28.8	53.9
WEO	14	5.2	5.2	59.2
VEO	20	7.5	7.5	66.7
Village pyrethrum selling agents	89	33.3	33.3	100.0
Total	267	100.0	100.0	

Sources: Computed from data

Market stability is essential for predictable prices and demand. Stability of pyrethrum prices and high demands together strengthen the supply side of pyrethrum farm households (Mulagoli, 2015). It is evident that, with market stability pyrethrum farmers are likely to benefit a consistent income welfare. In Figure 5, results show that 82.4% of pyrethrum farmers were very dissatisfied with market stability, 10.9% were dissatisfied, 3.4% were uncertain and the remaining 3.4% were satisfied. The results indicate that market for pyrethrum was less stable and thus pyrethrum farm households experienced unpredictable market and price fluctuations for their produce. Pyrethrum farmers failed to get consistent income for their welfare.

4.3 Subjective economic welfare

In Table 1 it was shown that the minimum annual household income considered very dissatisfactory was Tshs. 180,000/- and the maximum was Tshs. 8,430,000/-. The mean annual household income considered very dissatisfactory was Tshs. 1,325,060/- with a standard deviation of Tshs. 1,353,364/-. The results indicate that pyrethrum farm households needed about Tshs. 1,325,060/- for income that was very dissatisfied. Then results in Table 1 further show that the minimum annual household income considered dissatisfactory was Tshs. 300,000/- and the maximum was Tshs. 10,050,000/-. The mean annual household income considered dissatisfactory was Tshs. 1,597,640/- with a standard deviation of Tshs. 1,559,237/-. The finding indicates that pyrethrum farm households need about Tshs. 1,597,640/- for income that is however dissatisfactory. In addition, the results in Table 1 showed that the minimum annual household income considered satisfactory was Tshs. 390,000/- and the maximum was Tshs. 12,480,000/-. The mean annual household income considered satisfactory was Tshs. 1,868,200/- with a standard deviation of Tshs. 1,795,948/-. The results imply that pyrethrum

farm households in the study area needed at least Tshs. 1,868,200/- yearly as disposable income for satisfying their needs. Details are discussed together with findings on the want parameter in Section 4.3.1.

4.3.1 Want Parameter

Table 1 shows that the minimum want parameter was 12.62 and the maximum was 16.14. The mean want parameter was 13.9537 with a standard deviation of 0.75337. Since the want parameter was expressed by means of the natural logarithms of income the exponent of the want parameter represents the average income, an individual is considering dissatisfactory ($I = e^u$, $I = e^{13.9537}$). Therefore the average annual disposable household income considered dissatisfactory was Tshs. 1,148,193/-. This amount is less than the annual minimum wage of Tshs. 1,200,000/= (URT, 2013a). The result implies that pyrethrum farmers needed an annual total average income of more than Tshs. 1,148,193/- for satisfying their needs. This supports the observed perceived level of the satisfactory annual average income of about Tshs. 1,868,200/- .

4.3.2 Sensitivity Parameter

The sensitivity parameter of the welfare function defines the slope of the welfare function (Van Praag, 1968). Table 1 shows that the minimum sensitivity parameter was 0.05 and the maximum was 0.56. The mean sensitivity parameter was 0.2144 with a standard deviation of 0.09192. Since the standard deviation of sensitivity parameter was small it implies that the sensitivity parameter was close to the mean of about 0.2144. Sensitivity parameter of zero was not observed and there was no case of pyrethrum farm household heads being completely dissatisfied with any income less than e^u (Tshs. 1,148,193/-) and completely satisfied if exceeds e^u (Tshs. 1,148,193/-). The result implies that pyrethrum farm household heads appeared with different levels of satisfaction with income and the two extremes were not likely.

4.4 Subjective Well-being

Subjective well-being (SWB) is a self-reported measure of well-being, typically obtained by questionnaire (Diener, 1984).

Figure 6 Satisfaction with life after selling pyrethrum

In Figure 6, results show that 10.5% of pyrethrum farmers were very dissatisfied with the way they lived after selling pyrethrum, 11.6% of farmers were dissatisfied with the way they lived after selling pyrethrum, 16.1% of farmers were uncertain with the way they lived after selling pyrethrum, 57.7% of farmers were satisfied with the way they lived after selling pyrethrum and 4.1% of farmers were very satisfied with the way they lived after selling pyrethrum. These results imply that, after starting selling pyrethrum dried flowers farmers were experiencing high levels of satisfaction with life in general that attained their subjective well-being. The findings revealed that after selling pyrethrum dried flowers, farm household heads get income

to fulfill their farm households' needs and appear satisfied with the way of living compared to when they were not selling pyrethrum.

5. Conclusion and Recommendations

According to the presented results, it is evident that, pyrethrum farmers in the Makete district need an annual total average income of more than Tshs. 1,148,193/- for satisfying their needs which is supported by observed perceived level of the satisfactory annual average income of about Tshs. 1,868,200/-. The study also shows that, majority (57.7%) of pyrethrum farm household heads were satisfied and (4.1%) were very satisfied with life in the way they lived after starting selling pyrethrum. The study further reveals that about 38.2% of pyrethrum farmers were very dissatisfied, dissatisfied or uncertain with life in the way they lived after starting selling pyrethrum. On marketing factors, the study shows that the majority of pyrethrum farmers were very dissatisfied (73%) with rural farm transport and on local rural farm transport majority (48.7%) of the farmers were carrying pyrethrum harvests on their heads; on technological type of drying facilities paper shows that majority (80.9%) were very dissatisfied; on market information it is shown that the majority (79.8%) of pyrethrum farmers were very dissatisfied with way accessed market information. Inadequately pyrethrum farmers accessed information from Village Executive Officers (VEO) and Ward Executive Officers (WEO) compared to pyrethrum farmers accessed market information from other. Also on market stability this paper has shown that majority of pyrethrum farmers (82.4%) were very dissatisfied with market stability. Basing on these results, this study recommends that welfare and well-being policies for rural pyrethrum farmers should be multidimensional and oriented as to solving problems of poor rural farm transport, lack of modern technological type of drying facilities for drying raw pyrethrum white flowers, poor access to market information and poor access to stable markets; in order to facilitate for effective and efficiency pyrethrum marketing and to improve economic welfare and well-being of farmers in Makete district, Tanzania.

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Disclosure

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