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Understanding Production and Marketing Activities of Contract and Non-contract Sesame Farmers in Aunglan Township, Magway Region

Khaing Khaing Oo[1], Aye Moe San[2], and Theingi Myint[3]
[1] Staff officer, Dept. of Agriculture, Ministry of Agriculture, Livestock and Irrigation
[2] Lecturer, Dept. of Agricultural Economics, Yezin Agricultural University
[3] Professor, Dept. of Agricultural Economics, Yezin Agricultural University
khaingkhainghorticulture@gmail.com, dr.ayemoesan@yau.edu.mm, theingi.myint@gmail.com

Corresponding author: Khaing Khaing Oo (khaingkhainghorticulture@gmail.com)

ABSTRACT

Sesame is mainly grown in the central dry zone of Myanmar, in which, Magway Region occupied the largest sesame sown area for many years. Following the "Informal model" contract agreement among sesame farmers and buyers are practiced in Aunglan Township, Magway Region. This study aimed to explore the production and marketing performances of sesame farmers under contract and non-contract systems in the study area. By using purposive random sampling procedure, a total of 102 sesame farmers in Aunglan Township were interviewed by using structured questionnaires during November and December, 2017. Descriptive statistics and cost and return analysis were applied in this study. These findings indicated that contract farmers were younger and had less farming experiences as compared to non-contract farmers. Contract farmers received credit and market information from more diverse sources and more participated in training, meeting and field demonstration which were mostly related to sesame production practices in comparison with non-contract farmers. Production cost of sesame by contract farmers was higher as compared to non-contract farmers due to their higher usage of farm yard manure, compound fertilizers, gypsum and fungicide. However, it did not affect their returns because contract farmers received better sesame yield in comparison with non-contract farmers. Climate change, labor scarcity, unstable price and high input cost were major constraints for rain-fed dependent sesame farmers. There was still lack of advanced technology in quality checking, grading, thus, technology investment is crucially needed for producing good quality seeds. Sesame farmers should pay attention not only to quality improvement but also to overcoming current constraints along the supply chain. Overall performance in sesame production and marketing of contract farmers showed better in comparison with their counterparts even though current practicing contract system is needed to be systematically organized by learning experiences of other success stories.

Keywords: Sesame, Contract Farming, Magway Region, Myanmar

INTRODUCTION

Oilseeds are the third most important crop group after cereals and pulses in Myanmar regarding the cultivated areas, generating a substantial amount of foreign earnings and creating rural employment opportunities. Myanmar stood as the largest sesame seed producer in Asia and the second largest global sesame producer after Tanzania in 2017. Being as one of the leading sesame producing countries in the world, Myanmar occupied 34.81% and 13.81% of the total sesame production in Asia and in the world respectively (Food and Agriculture Organization of the United Nations Statistics [FAOSTAT], 2018).

Nearly 90% of the sesame was grown in the central dry zone of Myanmar: Magway, Mandalay and Sagaing Regions in 2017-2018. Magway Region stood as the largest sesame sown area in Myanmar which was contributed about 520,190 ha (34%) of the national total area of sesame cultivation (Department of Agriculture [DOA], 2018). As shown in Table 1, total production of sesame increased because of expansion of area and improved yield in which the clear trend can be seen in 2015-2016 across a decade. During July 2017, heavy rain occurred 2 to 3 weeks at the period of growing season and before harvesting stage of sesame, which caused less cultivation and great yield losses in that

year. The export volume was high in 2012-2013 and 2013-2014 then it gradually went down to less than 100,000 MT during 2014-2015 and 2015-2016. Thereafter, export of Myanmar sesame was increasing again and reached 120,990 MT in 2017-2018. Among different sesame exporting countries, China and Japan accounted for 80% to 90% of the export volume of Myanmar sesame in 2017-2018 (Ministry of Commerce [MoC], 2018).

Table 1. Sown area, harvested area, yield, production and export status of sesame in Myanmar

Year	Sown area ('000 ha)	Harvested area ('000 ha)	Yield (MT/ha)	Production ('000 MT)	Export *	
					Volume ('000 MT)	Value (million US$)
2005-06	1,338	1,262	0.40	504	44.72	34.04
2010-11	1,585	1,584	0.54	862	79.70	114.35
2011-12	1,595	1,594	0.57	901	95.66	135.85
2012-13	1,553	1,552	0.56	863	135.95	235.73
2013-14	1,622	1,606	0.57	909	192.33	355.00
2014-15	1,581	1,572	0.59	930	91.07	180.89
2015-16	1,640	1,611	0.59	943	96.62	130.91
2016-17	1,636	1,610	0.58	927	108.72	146.78
2017-18	1,590	1,539	0.54	829	120.99	147.00

Note: Export data* are taken from MOC
Source: MOALI, 2018

Sesame production in Myanmar is mainly dominated by smallholder farmers who depend only on rainfed farming. Sesame sector generally lacks the necessary technologies and institutions to strengthen its value chain and to contribute to the development although Myanmar has great potential in production and export. Similar to other developing countries, majorities of smallholder farmers in Myanmar do not have access to improved seeds and fertilizers. Insufficient credit, weather uncertainty and improper use of chemicals which can hamper quantity and quality of sesame lead production and marketing problems to smallholder farmers. Above 80% of the total sesame production is domestically consumed as a garnish, snack, flavoring, and most importantly, as cooking oil and the rest can reach the world market (Aleksandar Jovanovic, 2018). In this context, traditional production practices and weak linkages among stakeholders are major barriers to expand Myanmar's export share in world market.

Contract farming system has been considered as one of the potential business models to link smallholders to world market along the stable supply chain as well as the institutional solution in the provision of inputs, finance and technical assistance to resource poor smallholder farmers. Some viewed contract farming as unequal power relation between farmers and buyers (Centad, 2007 and Singh, 2002). Contract farming has been widely practiced because its benefits outweigh the negative effects and governments in many developing countries are increasingly encouraging it, nowadays. There are five kinds of contract farming models namely "the Centralized model", "the Nucleus estate model", "the Multipartite model", "the Informal model", and "the Intermediary model" (Eaton and Shepherd, 2001). Many scholars (Bijman, 2008, Eaton and Shepherd, 2001 and Runsten, 1999) have distinguished three types of broadly used contracts such as market specification contracts, resource providing contracts and production management contracts under different arrangement of contract models. According to the type of product, its markets and the local socioeconomic and political context, various kinds of contracts have been implemented and developments are occurring in Asia and Africa particularly with those agricultural products for export (Melese, 2010). Recent studies of contract farming system in Myanmar agriculture sector particularly in rice, sugarcane, rubber and poultry farming showed there are positive results on smallholder livelihoods (Moe San, 2017, Theingi *et al*, 2016, Dolly Kyaw *et al*, 2015, and Byerlee *et al*, 2014).

As an initial attempt to solve the production and marketing barriers of sesame farmers in Myanmar, Pyitharyar contract farming scheme was launched in Aunglan Township, Magway Region since 2003. The contract company provided sesame seeds, capital, efficient pesticide spraying method and SPS (sanitary and phytosanitary) demonstration to contract farmers and also purchased black sesame seeds which were exported to Toyota Tsusho Food Corporation and Kanematsu Corporation in Tokyo, Japan (Theingi *et al*, 2017). Despite that contract scheme was no longer proceeded, the contract farming scheme currently practicing in Aunglan Township, Magway Region has been following "the informal model" which is characterized by individual wholesalers (buyers) and sesame farmers usually on a seasonal basis. The informal contract model commonly limits in provision of material and technical inputs, grading and quality control. However, the current informal contract farming arrangement in Aunglan Township has been practicing providing seeds, credit, and market information to verbally contracted farmers and repaying sesame in kind or in cash to wholesalers at harvest. There is still no single contract farming system in sesame sector in Myanmar. Therefore, this

study was carried out to understand the cost and return as well as the production and marketing activities of contract and non-contract sesame farmers in Aunglan Township, Magway Region.

Research Methodology

Aunglan Township, Magway Region was selected as the study area because of its wide sown areas of top export sesame variety named Sahmon Nat. Aside from this is the fact that the study area has been practicing the informal contract system. Purposive random sampling procedure was applied to gather primary data such as farm and household characteristics, socio-economic condition, production, marketing activities and constraints faced by sampled households. Within Aunglan Township, one village from five village tracts respectively were randomly chosen and total number of respondents were 102 farmers composed of 60 contract farmers and 42 non-contract farmers. Sampled respondents were individually interviewed with structured questionnaires during November and December 2017. Descriptive statistics, cost and return analysis were applied with STATA 14 statistical software.

RESULTS AND DISCUSSION

Socio-economic characteristics of sampled farmers

Demographic characteristics of sampled farmers producing sesame in the study area is shown in Table 2. There was no significant difference in age and farming experience between contract and non-contract farmers. The average age of contract farmers were 47.63 years and that of non-contract farmers were 49.24 years. The average experiences in farming for contract farmers were 25.25 years while that of non-contract farmers were 26.19 years. Both groups occupied secondary education levels, however, non-contract farmers had significant high schooling years which were 6.71 years in comparison with contract farmers which were 5.25 years.

Table 2. Demographic characteristics of sampled farmers

Items (Year)	Contract farmers (N=60)	Non-contract farmers farmers (N=42)	t-test
Avg. age	47.63 (29 - 72)	49.24 (32 - 74)	0.78^{ns}
Avg. farming experience	25.25 (5 - 58)	26.19 (2 - 55)	0.38^{ns}
Avg. schooling year	5.25 (2 - 14)	6.71 (2 - 14)	2.22**

Note: The values in the parentheses represent range. *, ** and ***are significant at 10%, 5% and 1% level respectively, ns is not significant differences.

Selected family and farm characteristics of sampled farmers

As illustrated in Table 3, the average family size of sampled farmers was composed of about 4 family members ranging from the smallest 2 to the highest 10 persons, in which, 2.28 and 2.36 family members of contract and non-contract farmers involved in agricultural activities. Average farm size was 7.23 ha for contract and 7.47 ha of non-contract farmers respectively. Average sown area of sesame was 3.49 ha for contract farmers ranging from 0.61 ha to 12.15 ha, while non-contract farmers owned 2.95 ha in average within the range of 0.20 ha to 16.19 ha. The average sesame yield was 266.26 kg/ha and 247 kg/ha respectively for contract and non-contract farmers.

Table 3. Selected family and farm characteristics of sampled farmers

Items	Contract farmers (N=60)	Non-contract farmers farmers (N=42)	t-test
Avg. family size (No.)	4.20 (2 - 8)	4.50 (2 - 10)	0.94^{ns}
Avg. agricultural labor (No.)	2.28 (1 - 6)	2.36 (1 - 7)	0.33^{ns}
Farm size (ha)	7.23 (2.02 - 21.05)	7.47 (1.62 - 32.39)	0.20^{ns}
Sesame area (ha)	3.49 (0.61 - 12.15)	2.95 (0.20 - 16.19)	1.07^{ns}
Sesame Yield (kg/ha)	266.26 (60.49 -502.07)	247.00 (30.25 - 907.35)	0.72^{ns}

Note: The values in the parentheses represent range. *, ** and ***are significant at 10%, 5% and 1% level respectively, ns is not significant differences.

Ownership of farm and livestock assets by sampled farmers

Farm and livestock assets owned by sampled farmers in the study area are shown in Table 4. Sampled farm farmers owned more manual farm assets in comparison with farm machineries. All sampled contract and non-contract farmers possessed ploughs, harrows and bullock carts while less than 15% of sampled farmers had farm machineries such as tractors, power tillers and pulse splitting machine. In the context of livestock possession by sampled farmers, livestock rearing looked like a relatively small scale in the study area. However, nearly 100% of sampled farmers owned draft cattles for farming activities. A few proportions of sampled farmers raised pig and poultry.

Table 4. Farm and livestock assets owned by sampled farmers

Unit = Frequency

Items	Contract farmers (N=60)	Non-contract farmers farmers (N=42)
Plough	60 (100.00)	42 (100.00)
Harrow	60 (100.00)	42 (100.00)
Bullock cart	60 (100.00)	42 (100.00)
Sprayer	58 (96.67)	39 (92.86)
Generator	14 (23.33)	13 (30.95)
Thresher	8 (13.33)	9 (21.43)
Fodder cutting machine	6 (10.00)	6 (14.29)
Tractor	5 (8.33)	6 (14.29)
Power tiller	2 (3.33)	1 (2.38)
Pulse splitting machine	1 (1.67)	2 (4.76)
Htaw lar gyi (small truck)	1 (1.67)	0.00
Inter-cultivator	1 (1.67)	0.00
Cattle	59 (98.33)	41 (97.62)
Pig	7 (11.67)	2 (4.76)
Poultry	2 (3.33)	2 (4.76)

Note: The values in the parentheses represent percentage

Source of credit by sampled farmers

As in Table 5, some sampled farmers received credit from only one source while other took from two credit sources and other had three sources. As one credit source, majorities of sampled contract farmers (38.33%) took seasonal agricultural credit from Myanmar Agricultural Development Bank (MADB) only, followed by taking from township wholesalers, which was 13.33% of sampled contract farmers. Meanwhile, about 45.24% of sampled non-contract farmers acquired credit from MADB only which was followed by credit taken from township wholesalers (2.38%). Less than 2% each of contract farmers took credit from agro-input dealers alone, cooperatives alone and money lender alone. Regarding with two sources of credit about 11.67% of contract farmers received credit from MADB and township wholesaler, while about 21.43% non-contract farmers took credit from MADB and cooperative.

Table 5. Source of credit by sampled farmers

Unit = Frequency

Sources of credit	Contract farmers (N=60)	Non-contract farmers farmers (N=42)
Access from one source		
MADB	23 (38.33)	19 (45.24)
Township wholesaler	8 (13.33)	1 (2.38)
Agro-input dealer	1 (1.67)	0.00
Cooperative	1 (1.67)	0.00
Money lender	1 (1.67)	0.00
Access from two sources		
MADB and Cooperative	6 (10.00)	9 (21.43)
MADB and Township wholesaler	7 (11.67)	0.00
MADB and Money lender	0.00	3 (7.14)
MADB and Agro-input dealer	1 (1.67)	0.00
Township wholesaler and Cooperative	2 (3.33)	0.00
Access from three sources		
MADB, Agro-input dealer and Cooperative	3 (5.00)	7 (16.67)
MADB, Cooperative and Money lender	2 (3.33)	2 (4.76)
MADB, Township wholesaler and Cooperative	3 (5.00)	0.00
Nil	2 (3.33)	1 (2.38)

Note: The values in the parentheses represent percentage.

Access to production practices by sampled farmers

Sampled farmers in the study area received information related to sesame production practices from different sources like Department of Agriculture (DOA) and agro-input (fertilizers, pesticides, foliar, plant growth hormone, etc.) dealers. Majority of both contract and non-contract farmers which were more than 50% of each group respectively got information about production practices in association with not only DOA but also agro-input dealers, as shown in Table 6. It can be assumed that non-contract farmers relied more on agro-input dealers for this information. Sampled farmers received information about production practices in different ways such as through the meeting, training or field demonstration. Contract farmers had more involvement in training, meeting and field demonstration as compared to non-contract farmers. About 81.67% and 78.57% of contract and non-contract farmers obtained sesame production practices by attending meeting. More than 50% of contract and about 38% of non-contract farmers participated in training to get production practices while only 1.67% of contract farmers got production practices by exploring demonstration field.

Table 6. Access to production practices by sampled farmers

Source of production practices	Contract farmers (N=60)	Non-contract farmers (N=42)
Access from one source		
DOA	18 (30.00)	4 (9.52)
Agro-input dealer	5 (8.33)	8 (19.05)
Access from two sources		
DOA and Agro-input dealer	33 (55.00)	28(66.67)

Nil	4 (6.67)	2 (4.76)
Type of service received		
Meeting	49 (81.67)	33 (78.57)
Training	35 (58.33)	16 (38.10)
Field demonstration	1 (1.67)	0.00

Note: The values in the parentheses represent percentage.

Access to market information by sampled farmers

In the study area, sampled farmers had different sources to get access to market information as shown in Table 7. Majority of contract farmers (55%) accepted market information mainly from township wholesalers while majority, almost (41%) of non-contract farmers jointly received market information from township wholesalers and neighboring farmers. It is evident that township wholesalers and their neighboring farmers were found to be the most reliable and accessible information sources for sesame farmers.

Table 7. Access to market information by sampled farmers

Unit = Frequency

Sources	Contract farmers (N=60)	Non-contract farmers farmers (N=42)
Access from one source		
Township wholesaler	33 (55.00)	12 (28.57)
Neighboring farmer	5 (8.33)	12 (28.57)
Social media	1 (1.67)	0.00
Access from two sources		
Township wholesaler and Neighboring farmer	18 (30.00)	17 (40.48)
Township wholesaler and Social media	2 (3.33)	0.00
Neighboring farmer and Social media	0.00	1 (2.38)
Access from three sources		
Township wholesaler, Neighboring farmer and Social media	1 (1.67)	0.00

Note: The values in the parentheses represent percentage.

Composition of annual household income by sampled farmers

Different income sources which contributed to household income for sampled farmers were presented in Table 8. Annual household income was derived from crop income, non-farm income, livestock income and remittance income. Contract farmers significantly obtained higher crop income than non-contract farmers (2,343,988 > 1,466,528 MMK[1] per year). There were 18.33% and 26.19% of contract and non-contract farmers who earned from livestock raising. About 16.67% and 35.71% of contract and non-contract farmers got income from non-farm activities. In addition, only 5% of contract and 4.76% of non-contract farmers earned incomes from remittance. There was a significant difference in crop incomes at 5% level and other incomes were not significantly different in both groups of farmers.

[1] Exchange rate: 1 US$ = 1,365 MMK (Source: Central Bank of Myanmar, 2017)

Table 8. Composition of annual household income by sampled farmers Unit: MMK

Type of income	Contract farmers (N=60)		Non-contract farmers (N=42)		t-test
	No.	Avg. income	No.	Avg. income	
Crop income	60 (100.00)	2,343,988	42 (100.00)	1,466,528	1.97**
Livestock income	11 (18.33)	115,500	11 (26.19)	345,000	1.90ns
Non-farm income	10 (16.67)	442,833	15 (35.71)	844,524	1.48ns
Remittance income	3 (5.00)	146,667	2 (4.76)	157,143	0.07ns
Total HH income	60 (100.00)	3,048,988	42 (100.00)	2,813,195	0.39 ns

Note: The values in the parentheses represent percentage, *, ** and***are significant at 10%, 5% and 1% level respectively, ns is not significant differences.

Utilization of seeds, FYM and agrochemicals in monsoon sesame production by sampled farmers

Different amount of inputs used for sesame by sampled farmers in the study area as shown in Table 9. Sampled contract farmers used 6.09 kg/ha of seeds on average which was less than 6.48 kg/ha of non-contract farmers. Contract farmers applied Farm Yard Manure (FYM) over 2 ton/ha while non-contract farmers applied less than 2 ton/ha. Contract farmers used compound fertilizer almost 50 kg/ha but non-contract farmers used less than 40 kg/ha for compound. The average rate of urea fertilizer used by contract and non-contract farmers were 21.98 kg/ha and 29.29 kg/ha respectively. The average rate of 19.90 kg/ha and 16.47 kg/ha of gypsum was applied by contract and non-contract farmers respectively. Average amount of fungicide was 0.09 kg/ha for contract and 0.02 kg/ha for non-contract farmers respectively. As overall, contract farmers utilized high dose of farm yard manure (FYM), compound fertilizer, gypsum and fungicide in comparison with non-contract farmers. The usages of urea fertilizer, foliar fertilizer and insecticide of non-contract farmers were a slightly higher than that of contract farmers in the study area.

Table 9. Amount of input used by sampled farmers sesame production

Items	Units	Contract farmers (N=60)		Non-contract farmers (N=42)		t-test
		No.	Amount	No.	Amount	
Seed	kg/ha	60	6.09	42	6.48	1.25ns
		(100.00)	(3.78 - 11.34)	(100.00)	(3.78 - 7.56)	
FYM	ton/ha	36	2.27	25	1.90	0.96ns
		(60.00)	(0 - 9.90)	(59.52)	(0 - 6.20)	
Urea	kg/ha	31	21.98	25	29.29	1.20 ns
		(51.67)	(0 - 74.10)	(59.52)	(0 - 123.50)	
Compound	kg/ha	51	48.93	29	36.17	0.89ns
		(85.00)	(0 - 123.50)	(69.05)	(0 - 123.50)	
Gypsum	kg/ha	34	19.90	18	16.47	0.59ns
		(56.67)	(0 - 118.56)	(42.86)	(0 - 74.10)	
Insecticide	liter/ha	48	0.38	33	0.47	1.83ns
		(80.00)	(0 - 1.24)	(78.57)	(0 - 1.24)	

Fungicide	kg/ha	25	0.09	8	0.02	1.49*
		(41.67)	(0 - 0.62)	(19.05)	(0 - 0.49)	
Herbicide	liter/ha	15	0.18	11	0.17	0.74ns
		(25.00)	(0 - 1.61)	(26.19)	(0 - 1.24)	
Foliar	liter/ha	40	0.44	32	0.60	1.83ns
		(66.67)	(0 - 1.48)	(76.19)	(0 - 1.24)	

Note: The values in the parentheses represent percentage and range. *, ** and***denote significant levels at 10%, 5%, 1% level respectively, ns is not significant differences.

Cost and return analysis of monsoon sesame production by sampled farmers

Cost and return analysis of monsoon sesame production was determined by enterprise budgeting and illustrated in Table 10 and Table 11 for contract and non-contract farmers respectively. During 2017 monsoon season, effective yield of sesame (261.03 kg/ha and 237.04 kg/ha) and effective price (1,643 MMK/ha and 1,630 MMK/ha) were received by sampled contract and non-contract farmers.

Contract farmers used high dose of agro-inputs such as FYM, compound fertilizer, gypsum and fungicide, thus, total material cost was slightly higher for contract farmers which was 75,736 MMK/ha as compared to that of non-contract farm ones which was 71,392 MMK/ha. Total family labor cost for non-contract farmers was 49,576 MMK/ha while contract farm farmers spent 47,527 MMK/ha for family labor as opportunity cost. The hired labor cost for contract and non-contract farmers were 159,319 MMK/ha and 154,360 MMK/ha, respectively. Total variable cost per hectare of monsoon sesame was 301,371 MMK/ha for contract farmers and 293,307 MMK/ha for non-contract farmers respectively. Thus, total variable cost was higher in contract as compared to non-contract farmers. It was due to higher cost on some inputs and hired labor spent by contract farmers. Total interest on cash cost for contract and non-contract farmers were 18,788 MMK/ha and 17,979 MMK/ha, respectively. Total variable cash cost per hectare of monsoon sesame was 227,549 MMK/ha for contract farmers and 217,745 MMK/ha for non-contract farmers in the study area.

Table 10. Cost and return analysis of sesame production by sampled contract farmers

Items	Units	Level	Unit price	Total value
1. Gross benefit				
Effective yield	kg/ha	261.03	1,643	428,958
Total gross benefit	MMK/ha			428,958
2. Variable cost				
Urea	kg/ha	21.98	390	8,572
Compound	kg/ha	48.93	540	26,422
Gypsum	kg/ha	19.9	194	3,870
Insecticide	Liter/ha	0.38	10,604	4,030
Fungicide	kg/ha	0.09	12,000	1,080
Herbicide	Liter/ha	0.18	9,600	1,728
Foliar	Liter/ha	0.44	8,500	3,740
(a) Total material cost (cash)	MMK/ha			49,441
Seed	kg/ha	6.09	2,577	15,694
FYM	Ton/ha	2.27	4,670	10,601
(b) Total material cost (own)	MMK/ha			26,295
Total material cost (a+b)	MMK/ha			75,736
(c) Total family labor cost	MMK/ha	12.31	3,861	47,527
(d) Total hired labor cost	MMK/ha	37.86	4,208	159319
(e) Total interest on cash cost	MMK/ha	208760	0.09	18,788
Total variable cost (TVC) (a+b+c+d+e)	MMK/ha			301,370
Total variable cash cost (TVCC) (a+d+e)	MMK/ha			227,548
Net return (TGB - TVC)	MMK/ha			127,588
Return above variable cash cost (TGB - TVCC)	MMK/ha			201,410
Return per unit of cash expensed (TGB/TVCC)				1.89
Return per unit of capital invested (TGB/TVC)				1.42

Source: Authors' own calculation based on field survey data (2017)

Total gross benefit was calculated by multiplying effective yields and prices received by both contract and non-contract farm farmers respectively. Total gross benefit was about 428,958 MMK/ha for contract farmers while that for non-contract farmers was 386,589 MMK/ha. Return above variable costs (RAVC) for contract and non-contract farmers were 127,588 MMK/ha and 93,282 MMK/ha respectively. In addition, return above variable cash costs (RAVCC) were 201,410 MMK/ha for contract farmers and 168,844 MMK/ha for non-contract farmers. Due to higher effective yield and price received by contract farmers as compared to non-contract ones, contract farmers achieved higher gross benefit, returns above variable cost and variable cash costs, although they paid higher production cost. Return per unit of cash expenses was 1.89 for contract farmers while that for non-contract farmers was 1.78. Return per unit of invested capital or benefit cost ratio were 1.42 and 1.32 for contract and non-contract farmers respectively.

Table 11. Cost and return analysis of sesame production by sampled non-contract farmers

Items	Units	Level	Unit price	Total value
1. Gross benefit				
Effective yield	kg/ha	237.04	1,630	386,589
Total gross benefit	MMK/ha			386,589
2. Variable cost				
Urea	kg/ha	29.29	400	11,716
Compound	kg/ha	36.17	517	18,700
Gypsum	kg/ha	16.47	200	3,294
Insecticide	Liter/ha	0.47	10,610	4,987
Fungicide	kg/ha	0.02	12,000	240
Herbicide	Liter/ha	0.17	9,637	1,638
Foliar	Liter/ha	0.60	8,052	4,831
(a) Total material cost (cash)				45,406
Seed	kg/ha	6.48	2,453	15,898
FYM	Ton/ha	1.94	5,200	10,088
(b) Total material cost (own)	MMK/ha			25,986
Total material cost (a+b)	MMK/ha			71,392
(c) Total family labor cost	MMK/ha	13.67	3626.63	49,576
(d) Total hired labor cost	MMK/ha	32.11	4807.23	154,360
(e) Total interest on cash cost	MMK/ha	199,766	0.09	17,979
Total variable cost (TVC) (a+b+c+d+e)	MMK/ha			293,307
Total variable cash cost (TVCC) (a+d+e)	MMK/ha			217,745
Net return (TGB - TVC)	MMK/ha			93,282
Return above variable cash cost (TGB - TVCC)	MMK/ha			168,844
Return per unit of cash expensed (TGB/TVCC)	MMK/ha			1.78
Return per unit of capital invested (TGB/TVC)	MMK/ha			1.32

Source: Authors' own calculation based on field survey data (2017)

Marketing activities of sampled farmers

Marketing activities of sampled farmers included purchasing, selling, grading, weighing, and transportation activities. About 98% of sampled contract farmers directly sold raw sesame (in kind) to verbally contracted wholesaler while the remaining contract farmers sold raw sesame to open market and repaid in cash to connected wholesalers. All non-contract farmers sold to normal (unconnected) wholesalers in open market. Majority of sampled farmers (98.04%) sold raw sesame seed immediately after harvest and only less than 2% of sampled farmers sold out their commodity within one month by using cash down system. In the study area, none of sampled farmers used grading system before selling and their weighing measurement in selling was one basket equals 15 viss[2] (24.45 kg) (Table 12). There is no well-sound grading system to classifying and categorizing raw sesame seeds, only depends on the colors of the sesame and among the cultivated strains of Black, White, Red and Brown sesame.

[2] 1 viss = 1.63 kg

The modes of transportation used by sampled farmers were shown in Table 13. There were two kinds of transportation and most of farmers used light truck when selling the product. About 80.00% of sampled contract farmers and 54.76% of sampled non-contract farmers used light truck in the study area. In addition, 20.00% of contract farm households and 45.24% of non-contract farmers also used tricycle. About 95.00% of contract farmers and 92.86% of non-contract farmers sold to wholesalers in Aunglan and only 5.00% of contract farm households and 7.14% of non-contract farmers sold to wholesalers in Pyalo which is located under the same township, as presented in Table 14.

Table 12. Selling information of sampled farmers

Unit = Number

Main buyers of sesame	Contract farmers (N=60)	Non-contract farmers (N=42)
Sold to		
• Connected wholesaler	59 (98.33)	-
• Normal wholesaler in open market	1 (1.67)	42 (100.00)
Product selling time		
• Immediately after harvest	59 (98.33)	41 (97.62)
• Within one month	1 (1.67)	1 (2.38)
Product selling form		
• Raw	60 (100.00)	42 (100.00)
Type of selling		
• Cash down	60 (100.00)	42 (100.00)
Use of grading method in selling		
• No	60 (100.00)	42 (100.00)
Weighing measurement in selling		
• 1 Basket = 15 viss	60 (100.00)	42 (100.00)

Note: The values in the parentheses represent percentage.

Table 13. Mode of transportation to the market by sampled farmers

Mode of transportation	Unit	Contract farmers (N=60)	Non-contract farmers (N=42)	Total (N=102)
By light truck	No.	48 (80.00)	23 (54.76)	71 (69.61)
By tricycle	No.	12 (20.00)	19 (45.24)	30 (30.39)

Note: The values in the parentheses represent percentage.

Table 14. Market destinations of sampled farmers

Market	Contract farmers (N=60)	Non-contract farmers (N=42)	Total (N=102)
Aunglan	57 (95.00)	39 (92.86)	96 (94.12)
Pyalo	3 (5.00)	3 (7.14)	6 (5.88)

Note: The values in the parentheses represent percentage.

General constraints faced in sesame production and marketing of sampled farmers

Sample farmers principally responded the constraints during sesame production as compared to marketing stage. Achieving unstable prices from year after year was addressed as their major marketing constraint by sampled farmers as none of them had experienced in selling sesame outside the nearest local market and they perceived that they had stable market. All sampled farmers answered that they suffered climate change as a major production constraint in the study area because erratic rainfall and unfavorable temperature during monsoon season reduced sesame yield. Moreover, the common sesame production constraints faced by more than 50% of sampled farmers in the study area were labor

scarcity and high input cost. About 50% of sampled contract farmers addressed that lack of capital was their production constraint whilst only 26% of sampled non-contract farmers said that it was a constraint for them. Less than 30% of both contract and non-contract farmers replied that the incidence of diseases and pests, lack of extension service, high transportation cost and lack of improved varieties were constraints faced in sesame production. All these major constraints limited farmers by reducing yield and earning less income (Figure 1).

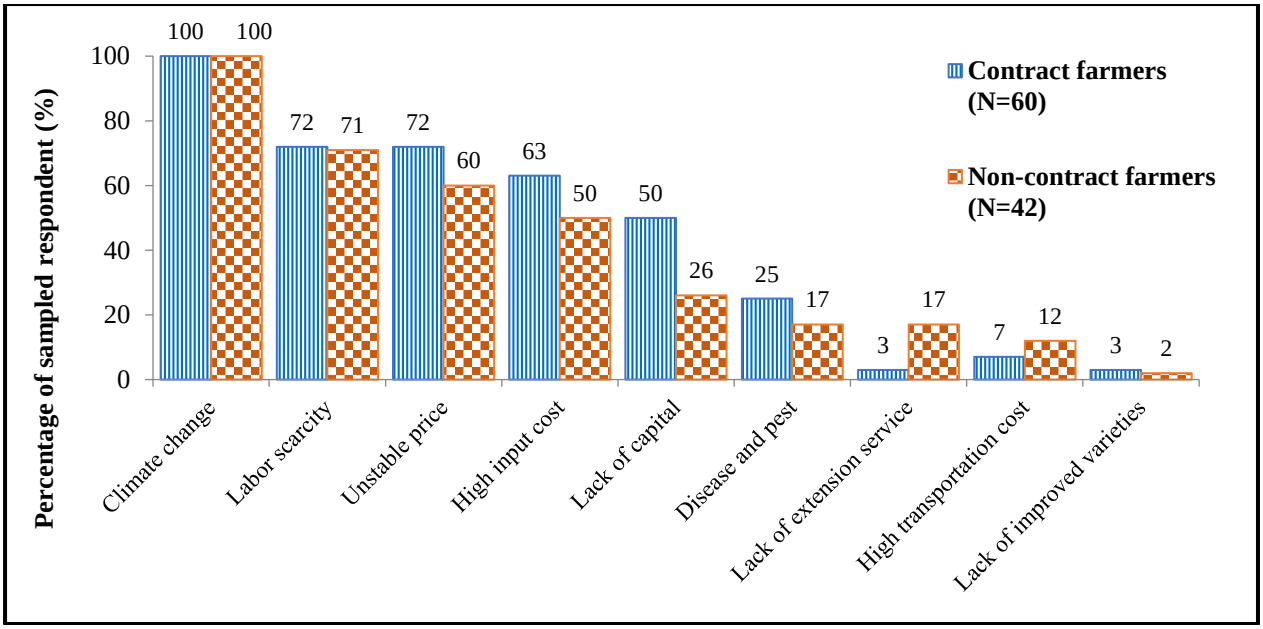

Figure 1. Constraints in sesame production and marketing by sampled farmers

CONCLUSION AND RECOMMENDATIONS

Production cost of sesame by contract farmers was relatively higher than non-contract farmers due to their higher usage of agro-inputs with high cost and hired labor cost related to labor scarcity. Majority of farmers still possessed manual farming tools and on the other side climate variability was the major constraint for them. Not only financial aid but also technical assistance would be required to offset current difficulties. Encouraging capacity building program for farmers concerning the environmental friendly production practices, improving access to farm level production inputs as well as labor and weather induced time saving techniques like farm mechanization would also be some of the attempts to boost the yield, high quality products and mitigating losses. Technology investment is also needed for producing good quality seeds due to still lack of advanced technology in quality checking and grading sesame.

This study revealed that price information was transmitted mostly from local wholesalers to farmers despite provision of market information is very important to generate better income. Unstable product price from year to year was the most experiencing marketing constraint for farmers, which was due to the linkage with international market demand which critically paid attention to quality. Market information database system to help addressing problems in association with sesame marketing should be established.

Overall performance in production and marketing of sesame by contract farmers was better than that of non-contract farmers in the study area although contract scheme was based only on verbal and mutual trustworthiness between local wholesalers and farmers, which was not well structured, comprehensive and systematically arranged at the moment. In order to get better performances of sesame farmers in Myanmar, more effective and comprehensive contract schemes should be practiced based on learning from other successful contract crops.

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