JEL Classification: C14, J43, Q12, Q15 **DOI**: https://doi.org/10.31521/modecon.V35(2022)-01

Nadhiya Abdulla, Ph.D. Student, Faculty of management and marketing, Dnipro State Agrarian and Economic University, Dnipro, Ukraine

ORCID ID: 0000-0003-2055-3350
e-mail: nadhiya.abdulla@agronational.mv

Natalia Vasylieva, Doctor in Economics, Professor of Department of Information Systems and Technology, Dnipro State Agrarian and Economic University, Dnipro, Ukraine

ORCID ID: 0000-0003-4100-0659
e-mail: vasylieva.n.k@dsau.dp.ua

Iryna Volovyk, Ph.D. in Economics, Associate Professor, Department of Management and Public Administration, Chief of International Affairs and Public Communication Office, Dnipro State Agrarian and Economic University, Dnipro, Ukraine

ORCID ID: 0000-0003-2160-2978
e-mail: interdsau@gmail.com

Key Regional Problems of the Contract Farming in the Republic of Maldives

Abstract. Introduction*. An agricultural sector in the Republic of Maldives mostly consists of smallholder farming communities which are highly restricted by low productivity and unavailability of natural resources. The AgroNAT contract farming was implemented to address this challenge but so far does not provide the expected results across the agricultural regions*

Purpose. *This research study looked into assessing and explaining the resemblances and differences observed in the analyzed agricultural regions 1, 2, and 3 regarding categories of gender disparity and farming population age, access to land resources, markets, and finance.*

Results. *Total of over 1200 farmers on 13 islands were interviewed to specify key influential factors of their farming activities. To check the study hypotheses, we utilized the Chi-square Test for Independence. It confirmed strong resemblances of regions 1 and 2 by gender disparity and farming population age in favor of male farm heads and farmers over 40 years old. In region 3 there are more females actively involved in the farming activities. The research findings also revealed that around 27% of the farming population in region 3 are the young aged below 40 who demonstrate essential interest in new agricultural technologies and are better educated in financial aspects. The research clarified that regions 1 and 2 are more affected by the indicators of `No arable land` and `Land tenure insecurity`. Whereas regions 2 and 3 appeared to be similar by the indicators of `Started farming` and `No arable land`. All the regions resemble by the access to finance and markets. However, the focus group discussion revealed that farmers in region 3 are more efficient in using financing opportunities provided by the government and private sectors. Whereas the logistic and transport options are more beneficial for regions 1 and 2 as their islands are closer to the capital city.*

Conclusions. *The study identified the weak spots and advantages of each agricultural region and recommended ways on how to increase efficiency and effectiveness of their contract farming.*

Keywords: *contract farming; land availability; farmers age and gender; access to finance and markets; econometric tests.*

УДК 332 : 631.1

Надхія Абдулла, аспірантка, факультет менеджменту і маркетингу, Дніпровський державний аграрно-економічний університет, Дніпро, Україна

Наталя Васильєва, докторка економічних наук, професорка кафедри інформаційних систем і технологій, Дніпровський державний аграрно-економічний університет, Дніпро, Україна

Ірина Воловик, кандидатка економічних наук, доцентка кафедри менеджменту, публічного управління та адміністрування, начальниця відділу міжнародних зв'язків та публічних комунікацій, Дніпровський державний аграрно-економічний університет, Дніпро, Україна

Ключові регіональні проблеми контрактного фермерства у Мальдівській Республіці

Аграрний сектор у Мальдівській Республіці складають дрібні фермерські громади, які мають низьку продуктивність та обмежений доступ до природних ресурсів. Державна компанія AgroNAT запровадила контрактне фермерство для подолання цих проблем, але досі не досягла бажаних результатів на регіональному рівні. Дане дослідження ставило за мету оцінку та пояснення подібності й відмінностей, що спостерігаються в аналізованих регіонах 1, 2, і 3, беручи до уваги критерії диспаритету за статтю та віком фермерів і доступу до землі, ринків та

[1]**Стаття надійшла до редакції**: 10.10.2022
Received: 10 October 2022

фінансів. Для виявлення особливостей фермерської діяльності проведено опитування понад 1200 фермерів на 13 островах. Для перевірки гіпотез дослідження застосовано Хі-квадрат тест на незалежність. Він підтвердив істотну схожість регіонів 1 і 2 за статевим диспаритетом і віком фермерів на користь чоловіків-голів ферм та фермерів старших за 40 років. У регіоні 3 жінки активніше беруть участі у керуванні фермами. В ході дослідження встановлено, що близько 27% фермерів регіону 3 молодші за 40 років та демонструють неабияку зацікавленість у нових аграрних технологіях і кращу обізнаність у фінансових питаннях. Також виявлено, що регіони 1 і 2 більш вразливі за показниками «Відсутність земельних угідь» та «Небезпека землеволодіння». В той самий час регіони 2 та 3 подібні за ознаками «Розпочато фермерство» і «Відсутність земельних угідь». Усі регіони схожі за доступом до фінансів та ринків. Проте обговорення з фокус-групою показало, що фермери регіону 3 мають вищу ефективність використання фінансових можливостей, запропонованих урядом і приватним сектором. Тоді як логістичні та транспортні опції є більш вигідними для регіонів 1 і 2, що розташовані ближче до столиці. За підсумками дослідження вдалося ідентифікувати слабкі ланки та переваги кожного аграрного регіону та рекомендувати напрями підвищення ефективності їх контрактного фермерства.

***Ключові слова**: контракте фермерство; доступ до землі; вік та стать фермерів; доступ до фінансів і ринків; економетричні тести.*

***JEL Classification:** Q 10; Q 12.*

Formulation of the problem. Maldives is a middle-income country, where 54% of its population live in rural areas and their main source of income depends on agriculture and fishing. The COVID-19 pandemic decreased economic activity by 1.4% and forced more than 80% of the rural population into farming activities as means of earning a viable income as well as a source of food and nutrition [1]. Despite the large amount of funds allocated to develop the agricultural sector and smallholder farming communities, there are many challenges that hinders the agricultural growth and sustainability especially in a more socially inclusive and regionally misbalanced manner. This disparity remains huge between the capital city Male', which is the main market point of the whole Maldives, and other rural islands and different socio-economic status groups [6]. Unlike other countries Maldives is highly susceptible to economic shocks due to the geographical dispersion of population, lack of land resources and remoteness of the islands.

The newly elected government put forward policies and initiatives in developing and sustaining the smallholder farming communities which dominate the rural part of the country. This resulted in the national strategic plan launched to develop agriculture across Maldives, make it an economically viable industry and incorporate into the government's `Blue Economy`. To achieve this, the government established a 100% state owned company named Agro National Corporation (AgroNAT) under Maldives Fund Management Corporation with an overall mandate to assist local farmers and reduce imports of 17 types of crops (including fruit and vegetables) by at least 50% by the end of 2023 [2]. AgroNAT is administered by the government budget and its programs are funded by Maldives Fund Management Corporation, UNDP Maldives, and other donor agencies.

AgroNAT implemented contract farming model in three regions of Maldives, where smallholder farming communities are prominent and completely depend on their farming activities as their main source of income, nutrients, and way of living. Contract farming is mutual understanding or agreement between the company and farmers benefiting each other under the set terms. In particular, farmers agree to provide certain quality and quantity of products to the purchaser, where the latter provide production support, input supply and technical advice. Growth of smallholder farming communities in Maldives is highly restricted by low productivity, unavailability of natural resources such as land and water as well as insufficient profits to make beneficial investments. The objective of this research study is to understand the difference and similarities between the islands in three different regions and explain how they affect the production efficiency across these areas.

Analysis of recent research and publications. In contract farming contractual foundations are mainly based on the three areas which include market, resource, and management provisions. Majority of the community farmers cannot develop further due to the unavailability of funds and financial supports from the government and other agencies. The AgroNAT contract model focuses on developing the rural smallholder farming communities to attain sustainability and self-sufficiency. In addition to this, the framework of the AgroNAT contract farming model is designed in such a way that it directs the agricultural system to increasing local production, reducing agricultural imports, moving farming from conventional methods to technology integrated climate smart farming which is beneficial for enhancing country's food security and nutrition [6].

Effective management of contract farming such as effective resource allocation and financial management will increase farmers' profit, productivity, and quality of their products. It will also have a positive impact on the company's income. Some scientists argue that contract farming marginalize the poor farmers giving priorities to the farmers who have access to land and enhancing inequality within the communities [10]. However, other studies show that this is not completely true. Namely, welfare of the rural farming communities improved after providing them access to finance and markets because farmers join contract farming parties seeking additional support and help to achieve sustainability moving towards advanced technology and products quality. Therefore, contract farming should be effectively and efficiently

managed in order to meet the expectations of the farming communities [3].

The contract farming model implemented by AgroNAT benefits the local farming communities in several ways. Based on the contracted size of land and crop, the farmer is given a specific amount of required inputs for the chosen crops based on the targets of the company. This helps the company as well as the farmer do plan and investments to reduce transaction costs and uncertainty around prices and market options [9].

Unfortunately, though many farmers obtained requested inputs and technical assistance, the company could not meet the expected production targets, according to the AgroNAT report [2]. It also suggests that most of the farmers, who joined AgroNAT contract farming program, were not completely agree with the company's buying price. As a result, a large part of the farmers was not ready to give up their autonomy. Seeking more profit, farmers sold their crops to other buyers. Therefore, it is critical to prevent side-selling [15].

The research study of regional contract farming in Maldives was carried out in [1]. A total of 13 islands were visited and data from 700 farmers were accumulated to identify the efficiency of farms in crop production from three different regions in Maldives, where AgroNAT implemented contract farming model in 2021. More than 1200 farmers were directly interviewed to understand the nature of their farming and assess the situation of agriculture in Maldives. In region 1 there were 5 islands with 165 contract farmers and their total land area of 475839 SQFT. In region 2 there were 3 contract farming islands with 116 contract farmers who cultivated 845565 SQFT of agricultural land. Region 3 included 6 islands with 200 contract farmers and their total land area of 451556 SQFT. The opportunities and characteristics of the farming population revealed the necessity to specify key influential factors of their farming activities. Such investigation should be accomplished as a complex comparative analysis of social, productive and marketing categories.

Formulation of research goals. The purpose of our research was to evaluate and explain resemblances and differences observed in the analyzed agricultural regions 1, 2, and 3 with regard to categories of gender disparity and farming population age, access to land resources, markets and finance.

Outline of the main research material. In this study, the data were collected using the primary sources such as interviews and focus group discussions as well as official materials available from the AgroNAT record keeping.

In order to identify differences and prove similarities existing in Maldivian agriculture in regions 1, 2, and 3, we applied the Chi-square Test for Independence. It makes it possible to compare two hypotheses concerning two categorical variables with I and J groups of values respectively. In particular

- null hypothesis H_0 supposes that the variations between the observed and expected values are random and the explored categorical variables are unrelated;
- alternative hypothesis H_α suggests the meaningful variations between the observed and expected values which implies that there exists some relationship between the considered categorical variables.

In theory, the analyzed data incorporate two tables containing observed O_{ij} and expected E_{ij} frequency associated with value i of the first variable and value j of the second one, i=1..I, j=1..J. The calculated Pearson's chi-square value X^2 can be found through the formula (1):

$$X^2 = \sum_{i=1..I\, j=1..J} ((O_{ij} - E_{ij})^2 / E_{ij}). \quad (1)$$

To carry out the Chi-square Test for Independence we need a critical Chi-square value $X^2(\alpha, df)$, where the parameter α denotes the significance level and the coefficient df = (I-1)·(J-1) is a number of degrees of freedom. The true inequality (2):

$$X^2 \le X^2(\alpha, df), \quad (2)$$

rejects the hypothesis H_α and confirms hypothesis H_0. It proves that the categorical variables are independent, and groups of their values don't influence each other. In contrast, the true inequality (3):

$$X^2 > X^2(\alpha, df), \quad (3)$$

rejects the hypothesis H_0 and confirms hypothesis H_α. It means that the categorical variables are essentially related, and groups of their values have a significant impact on one another.

According to the FAO database [7], 54% of the registered farmers are rural women who work in the farmlands without proper farming equipment and knowledge. This not only results in the loss of the natural resource but in their health as well. Women farmers who are involved in farming are also being marginalized to menial jobs such as weeding, planting, and harvesting, whereas men play the decision-making role [11; 12].

Table 1 contains initial data on gender distribution observed in farming communities in regions 1, 2, and 3.

Table 1. **Data on gender disparity in regional agriculture**

Head of the family farm	Region 1	Region 2	Region 3
Males	95	90	147
Females	7	8	112

Source: composed by the authors

The performed Chi-square Test for Independence (1)-(3) with I=2, J=2, and conventional α=0.05, led to true inequality

$0.122 = X^2 \le X^2(\alpha, df) = 3.841$,

which revealed a similar representation of males and females head farmers in regions 1 and 2. It is explained by the fact that their main source of income and living depends on farming. Unlike other islands, men in region 3

can earn a living by fishing and women could support their families by selling the dried fish and other fish products. Islands in regions 1 and 2 do not practice fishing. Their population, uninvolved in government and private sectors, depends on farming activities. Owing to internal immigration from remote islands, women have to support their families and carry out farming activities. They also sell locally grown vegetables and fruit in their home-made street stands.

In total global gender disparity is experienced for many reasons. Firstly, women have less time to take part in economic activities due to complex household duties and pursuing multiple livelihood strategies. Moreover, women have less access to productive resources, such as certified seeds, crop-specific fertilizers, and chemicals as well as agricultural finance [14]. Recent research shows that contract farming can reduce the gender gap by increasing the net economic benefits for both women and men and leveraging differences between women and men in farming activities [16].

This could be further proven as the introduction of contract farming model provided women farmers of the community with quality inputs to grow their chosen crops. Moreover, within this contract farming model all the farmers regardless of the gender are trained and supported with technical skills and knowledge in carrying out the farming activities. With this model, farmers are closely monitored and guided to deal with cultivation, harvesting and other farming related issues. It boosts women's contribution to farming activities while managing their families.

One thing observed among the Maldivian farmers is that more than 80% of the farmers are above 40 years of age and practice farming with the knowledge passed on by their elders. These farmers have very poor knowledge of managing soil nutrients, and little knowledge of the correct application of fertilizer and chemicals [8]. Their actions and methods further deteriorate the condition of their farmlands. To check our hypotheses, we aggregated initial data on farming population age in regions 1, 2, and 3 in Table 2.

Table 2. **Data on farming population age in regional agriculture**

Head of the family farm	Region 1	Region 2	Region 3
Below 40 years of age	2	5	70
Above 40 years of age	100	93	189

Source: composed by the authors

The performed Chi-square Test for Independence (1)-(3) with I=2, J=2, and conventional α=0.05, led to true inequality

$1.460 = X^2 \leq X^2(\alpha, df) = 3.841$,

which confirmed a strong resemblance of regions 1 and 2 by farming population age. According to studies, farming activities acts as a mean of living for older people in low- and middle-income countries [13]. Maldives is a middle-income Asian country where 75% of the agricultural population are over 60 and life expectancy of an average Maldivian is 79.6. This means that most of the old active population falls within the age group of 40-60. We clarified that regions 1 and 2 have higher number of farmers above 40. This is very true as the young who graduates from schools relocate to nearby islands to be employed in the tourism sector. As in all the developing nations, agriculture and farming activities are considered as a low level of work and, hence, young working population shows no interest in joining farming activities [5]. This is true because even now most of the farmers use traditional methods of farming with extensive amount of labor work required for long hours. Almost 99% of the farmers in regions 1 and 2 have no access to running water and electricity in their farms and still stick to utilizing traditional method of farming. In these two regions more than 90% of the farmers are those who have completed primary level of tradition education and don't have alternative means of income in supporting their family. The young generation born in 1990's had access to the secondary level of education in these two regions. The young travel to bigger islands or nearby resorts in search of employment and leave the old, aged population to do the menial earning activities such as farming.

The striking difference can be seen clearly in region 3. There are more active farmers below 40 years old. It means that around 27% of the farming population are young farmers aged below 40. As mentioned before, region 3 is more developed in comparison to regions 1 and 2. Region 3 has more economic activities, such as tourism, grocery shops, market outlets and private sector, targeted by commercial farmers. Since there are several tourist resorts nearby the region 3, the local farmers produce can be easily sold for a good profit [4]. Local tourism also supports young farmers. Moreover, most of the UNDP and IFAD projects are also carried out in region 3 providing them technology-based farming methods such as auto pots, fertigation, hydroponics, and greenhouses which attract the young generation to carry out the farming activities.

Availability of arable land is a challenge faced by all the developing countries which depend on farming activities as a mean of eradicating poverty and providing staple income. Maldives is similar in this regard. Due to urbanization, most of the lands were occupied for living purpose and only a small amount of land area was left for farming. One of the major challenges faced by AgroNAT in implementing contract farming model was the availability of land to the farming communities who wished to join the

contract farming program. Table 3 accumulates initial data on land accessibility in regions 1, 2, and 3.

Table 3. **Data on land accessibility in regional agriculture in Maldives**

Number of farmers	Region 1	Region 2	Region 3
Started farming	90	150	219
No arable land	100	112	184
Land tenure insecurity	115	125	105

Source: composed by the authors

Here we found two similarities.

Firstly, the performed Chi-square Test for Independence (1)-(3) with I=2, J=2, and conventional α=0.05, resulted in true inequality

$0.025 = X2 \leq X2(\alpha, df) = 3.841$,

which showed a strong resemblance between regions 1 and 2 by indicators of `No arable land` and `Land tenure insecurity`.

Secondly, the performed Chi-square Test for Independence (1)-(3) with I=2, J=2, and conventional α=0.05, resulted in true inequality

$0.544 = X2 \leq X2(\alpha, df) = 3.841$,

which revealed a strong resemblance between regions 2 and 3 by indicators of `Started farming` and `No arable land`.

The interviews, questionnaires, and focus group discussions specified that region 1 and 2 have no arable land and land tenure insecurity. That is the newly implemented Land Use Plan Act (LUP) which has taken the farming lands from farmers who were carrying out farming activities. Besides, some local government bodies and island atoll council decreased the land leased period to 6 months narrowing down farming communities to carry out long term farming activities. Unfortunately, many island councils of regions 1 and 2 still have not finished developing these LUP. As a result, there are many farmers who have joined the contract farming program and started farming but have to be `on hold` due to the delay of this plan. There are some farmers whose farmland area is being taken by the council for tourism and housing purposes. Thus, despite the fact that AgroNAT has registered and provided farmers with inputs, technical skills and knowledge, farmers are not able to carry out the farming activities due to described challenges.

AgroNAT signs an agreement with a farmer if he or she has more than 1500 SQFT of agricultural land. Under this agreement company provides farmers with chemicals, fertilizers, equipment, and tools to perform their farming activities. Farmers are provided training programs on how to use fertilizers and chemicals as well as how to sow, cultivate, harvest and store the crops. Crops are monitored for their quality by the selected employees of the company who work along with the farmers as coordinators or extension officers. To enhance the livelihood of the farming communities and provide profits to the farmers, the company buys 100% of the farmers produce. Farmers are provided under a 20% discount price compared to the market average level. Farmers are required to pay this loan credit amount within two periods. AgroNAT is a 100% government company and hence its main objective is to build and develop the farming community rather than to gain profit. Therefore, this credit loan amount is deducted (2%) from each of their harvest which they sell to AgroNAT. Throughout the past two years company has run on loss but it provided transport and logistic market access for over 1000 farmers. Also, the company has supported more than 35 farmers in developing technology integrated farming techniques for growing highly demanded crops such as `Honey-Melon` and `Riches` variety of salad cucumbers. Moreover, in order to reduce post-harvest damage the company has built 3 cold storage areas in three different islands. Other key issues witnessed in regional agriculture were aggregated in Table 4.

Table 4. **Data on key issues in regional agriculture in Maldives**

Number of farmers struggling	Region 1	Region 2	Region 3
Supply of inputs	105	160	99
Accessibility to markets	97	103	189
Accessibility to finance	98	112	190
Climatic instability	5	12	30

Source: composed by the authors

Here we also managed to clarify two similarities.

Firstly, the performed Chi-square Test for Independence (1)-(3) with I=2, J=3, and conventional α=0.05, resulted in true inequality

$0.231 = X^2 \leq X^2(\alpha, df) = 5.991$,

which revealed that all 3 regions are similar by access to markets and finance.

Secondly, the performed Chi-square Test for Independence (1)-(3) with I=4, J=2, and conventional α=0.05, resulted in true inequality

$5.775 = X^2 \leq X^2(\alpha, df) = 7.815$,

which showed a strong resemblance between regions 1 and 2 by all listed agricultural issues.

The main purpose of the AgroNAT contract farming model is to empower local farming communities by providing them access to markets and finance so that they achieve sustainability and economic viability. Our calculations shows that all three regions have equal access to markets and finance. This is because AgroNAT company provides logistical supports to the farmers to deliver their produce to the markets points regardless of where they are located. However, the logistic and transport options are easier for those islands which are closer to the capital city. This include islands of regions 1 and 2. In spite of this, the company has built cold storage facilities in these areas to keep the perishable goods at the right temperature until they are being sold off or transported to the nearest market point. The Maldivian government has also implemented small entrepreneurship loan schemes and other financial support to women to strengthen their economic activities.

At the same time, through the focus group discussion it was evident that farmers in region 3 are much more efficient in using financial opportunities provided by the government and private sectors. In regions 1 and 2 there are long administrative procedures that most farmers need to undergo, and their older farmers demonstrate a poor financial literacy level which withholds them from effective use of these opportunities. On the other hand, region 3 has younger population who are more aware of such procedures and thus are more financially successful.

Conclusions. Overall, the study findings confirmed the research hypotheses about the variations in variables across considered agricultural regions. The outcome of this research proves that small-scale farmers benefit from their activities when they are involved in contract farming. The conclusive recommendations are as follows.

On the downside, farmers in region 1 are more aged and have limited access to arable farmland. To make up for these issues, they have stable access to finance and markets to scale up their farming activities. For this to happen the local governing authority need to invest in educating young farmers through the grants and programs from nonprofit organizations such as UNDP and IFAD. Given the scarcity of land resources in region 1, the youth can utilize the technology integrated farming methods to increase volumes of their output.

On the upside, region 2 has the highest farmland area compared to all the other regions. However, the farmers are marginalized by government land restrictions imposed by the LUP. In our opinion, immediate interventions at local and government levels need to be taken to let the farmers continue with their activity benefitting from better access to finance, markets and cold storage facilities.

It was proved that region 3 has a larger share of young farmers and greater access to finance and markets. Region 3 has potential in gaining sustainability and scaling up the smallholder production. Thus, there should be more government intervention in improving farm management and moving the young away from conventional agricultural methods to technology-based farming.

Relevant further research should consider how the young population can be attracted to farming activities in Maldives. In depth research can be carried out on how to distribute the country's resources to ensure that a fair proportion of them is allocated to the agricultural sector aiming the growth and sustainability of smallholder farming communities to tackle the poverty, unemployment, and food insecurity.

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