



## **Rice Community Transformation and Human Wellbeing at Stung Chreybak Catchment, Kampong Chhnang Province, Cambodia**

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### **Abstract**

Over the past three decades, agrarian transformation of Cambodia society has set up itself in the forms of policy reformed, rural-urban growth, market-private and export- traded oriented. Under of this transformation, partly agriculture sector has transformed towards agricultural technologies, applied chemical fertilizers and hybrid rice varieties to increase rice production. In contrast, there are some challenges under the transformation process such as financial capital are constrains, limited rural physical infrastructure development, lack of technical business and marketing policy. This paper aims to examine of agrarian transformation begins in rural community. The focus will be on the change in rice growing concerned from farmers and their communities. Secondly, identify key drivers propelling these changes in family economic and analyzing the impact from the transformation for farmer's economic, wellbeing at household and communities levels. In addition, the study will argue that while the changes in technologies, marketing and institutions are consistent and analysis needs to take a full account on family farmer and community context.

**Keywords:** Agrarian transformation, Family economics, Well-being, Technologies.



## 1. INTRODUCTION

From mid-2010s, country has transformed from subsistence consumption to industrial sectors, urbanization and private export oriented (Nith, 2018). Agricultural technology has figured 97% used agricultural machinery only 3% used an animal and human labor (Nith, 2018). In the past from 1979 to 1985, rice farmers formed as “Krom Samaki”. In the Krom Samaki shared labors in rice growing. The Krom Samaki dissolved in 1989, after State of Cambodia has transformed centrally planned economy to private economy (Hughes, 2003).

Under this change, the Krom Samaki changed and agricultural land has turned into a private property of household farmer individually. In 1993, Cambodia country first organized a free and fair election, run by United-Nation-sponsored, to set up multiparty political parties. Since 1993, a number of national development policies in agricultural sector have shifted into “triangular strategy”.

The “Triangle Strategy” of the Government, which was adopted after July 1998 election. It designed and formulated to implement with three sides of strategies. The first side of strategy is to restore peace, stability and security for the nation and people. The side aims to create favorable conditions for Cambodian towards prosperity. Second side is to normalize its relationship with the international communities, for instance, Cambodia has become the 10th member of the Association of South East Asian Nations (ASEAN), and member of the World Trade Organization (WTO). Third side is to promote an economic and social development, and an extensive policy reform program (Hughes, 2003).

Gross Domestic Product (GDP) was 7.1% rate and continually in recent decade, which is a shared contribution from agricultural production exportation. Rural farmer income generation, access to higher education, access to good health care, convenient markets for agricultural products have emerged increasingly (McGillivray, 2008).



Yet, Ministry of Agriculture Fishery Forestry (MAFF) report (2018) showed that rural farmers have challenged in rice product is uncertainty price with the private markets. In addition, investment costs of an electricity supply, storage-processing facilities and agricultural inputs were concerned (MAFF, 2018). The study indicates land ownership of rural farmers are controversial issues such overlapping boundary of rice field with an economic land concession is unclear.

Access the credit is a key challenge with high interest rates and lower price of agricultural products for sale to moneylender of smallholder farmers in rural communities. As a result, poor smallholder farmers trapped in sale of agricultural product with lower cost in the peak harvest (Chan, 2002). The study also identifies driver of changes in rice practices of rice community transformation and on human wellbeing, and its impacts identified and studied at the rice farming communities of Stung Chreybak Catchment.

The objectives of the study are 1) to study changes in agricultural policy and practices concerned with rice farmers from household and their communities. 2) to identify drivers propelling these changes in rice practices, income diversifications and livelihoods. 3) is to analyze the impact of agrarian change on human wellbeing of rice farming households and their communities. In addition, the study focus on analysis of key drivers of transformation in relationship to rural economic diversification, agricultural technologies and impacts from transformation on family farmers and community level.



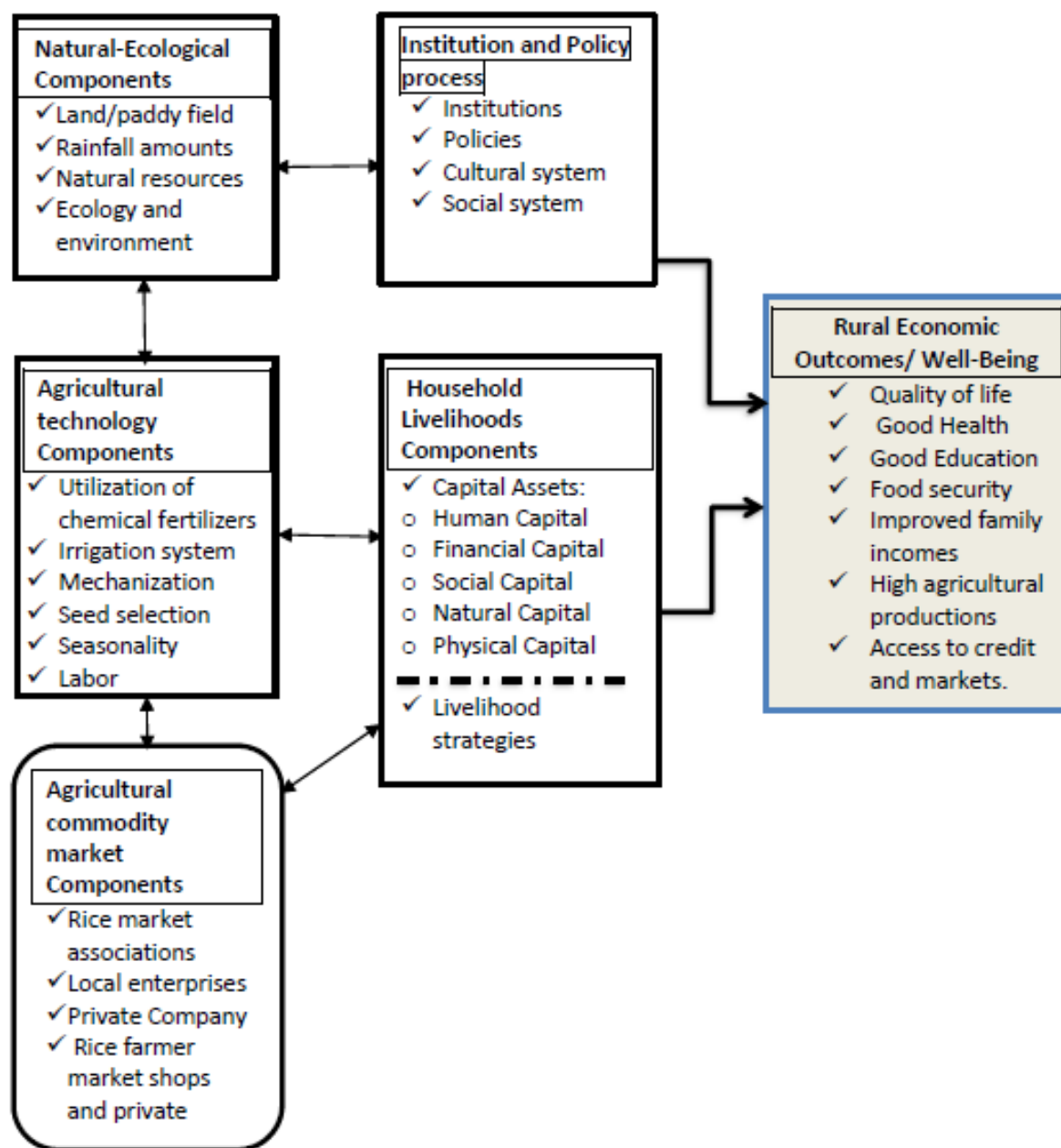
## 2. METHODS

The data collection approaches consist of involving the collection, processing and analysis of both qualitative and quantitative. The exploratory sequential mixed method design is employed to collect data. The aim of applying an exploratory sequential mixed method design is to measure with specific sample of population and to seek for data collected from research instruments in qualitative data that generalizes to a large sample of a population in quantitative data. This method used to examine on change in rice farming, household livelihood, natural resource use, agricultural commodities and market, agricultural technologies and policies and institutional arrangement in order to examine how these components are inter-exchangeable and to enable improved livelihood outcomes and wellbeing.

Survey design uses for examining the relationship variables, are core component of quantitative method in order to answer to research objectives. The qualitative data collection approaches involve in research instruments such as field observations, key informant interview, household survey (questionnaires) and focus group discussion. For instance, the secondary data collect from different data sources including the again transformation from many international journal articles and national and provincial annual reports on agriculture (MAFF, 2018), and various provincial department reports in agriculture, rural developments. Whereas primary data applied including the focus group discussion and key informant interview and field observation.

Sample size of interviews selected farmers, non-farmers and traders, village headmen, teachers and older from the selection of six villages in Tang Krasang and Trapang Trabak rice communities. In addition, the study elaborated conceptual framework on agrarian transformation and human well-being of two rural communities at Stung Chreybak, which presents in the figure (1). The figure (1) aims at illustrating and explaining the process, relationship and linking on rice community transformation and human well-being, with different components in order to analysis, how each component has interrelationship from one component to another and its reflects to current changes and impacts livelihoods and wellbeing of rice farming communities in Stung Chreybak.

Figure (1) Conceptual Framework: Agrarian Transformation and Human Well-Being of Two Rural Communities at Stung Chreybak, Kampong Chhnang Province, Cambodia



*Source: This conceptual framework has been adapted and revised from knowledgeable advice of Prof.Dr. Buapun Promphakping, 2020.*



### 3. RESULTS AND DISCUSSION

#### ✓ Rice Farming Practices

Rice farming practices have changed dramatically over the past 10 years. As of 2010, people's farming is still ancient, with their farming using livestock (cows/buffaloes) for plow, the method of growing rice is transplanting, harvesting rice. Hand-harvesting, hand threshing by using the cow or buffaloes to transport rice. As for the maintenance of rice, it is difficult to irrigate the fields, as there were no canals or irrigation at that time, relying only on rainfall. The use of fertilizers, at that time, villagers no used of chemical fertilizers only the use of natural fertilizers made from animal manure (cow/buffalo).

Behaviors of farmers in rice growing has changed dramatically due to the change of ecological natural resources and institutional and social dimensions. The traditional rice practices for hundreds of years by using animal labors and non-chemical inputs have transformed gradually by using agricultural technologies, heavy chemical fertilizers and pesticide application and rice intensification toward the increase of rice production for family consumption and commercially export-oriented markets, which occurred in recent decades of Cambodian farmers.

In mid-2010s, rice growing has changed from local rice varieties to started growing imported-hybrid rice varieties intensively. The existing irrigation system has rehabilitated to irrigate water to the expansion of paddy field for rice. Conducted Interview with key informants revealed that in early of 1980s, on average yield was one ton per hectare it is because of farmers used traditional rice growing materials and applying small amount of chemical fertilizers.

Since, farmers used new agricultural technologies, applied chemical fertilizers and with supplementary irrigation during the dry spell period, resulting in the rice yield increased from one ton to four tons per hectare in 2015 and increase up to six tons of rice per hectare in 2019 and in 2020. Hybrid rice varieties such as Phka Romdul, Neang Non and Jasmine are medium-term rice and photoperiod sensitive varieties with shortened harvest time and give high yield.

From mid of 2015, farmers like to grow the Phka Romdul variety, which has growth gradually and increased in large scale in communities, because this rice production is good price and main source of income for farmers. Farmers explained that Phka Romdul rice varieties are



medium-term rice and photoperiod sensitive crop and period from growing to harvesting has shortened, compared to traditional long-term rice varieties that farmers used to grow before.

In the past, most of farmers used animal labor to plow rice, transplant rice and hand harvest rice. Currently, most of farmers change to new rice varieties with machineries for increasing of rice production in the communities. As a result, farmers have more times to get involvement in diversification jobs such as off-farm jobs, working in the garment factories in provincial town, making handicrafts, making sugar palm, growing sweet potatoes, raising domestic animals as ducks, chickens, pigs and running motor-bikes.

These diversified activities increase household incomes from rice production and off-farmers wages, remittances from migrants use to buy chemical fertilizers, hired wage labors, hire agricultural machineries to replace expensive agricultural labors. However, at the present, most of villagers use their remittances send back from migrants, especially overseas migrants to purchase only agricultural inputs, but also to build or upgrade their houses, buying new motor bikes and cell-mobile-phone and other materials.

In addition, income from rice production and non-farmers cash, remittance can improve the quality of life in the communities and children are able to have higher education and spending in social and cultural celebration, parties and wedding.

#### ✓ **Agricultural Mechanization**

Mechanization of dry season rice farming in Stung Chreybak was to occur rapidly. Using of modern machinery changed by subsistence orientation, low rice yield and animal labor that applied traditional farming. Since early of 2015, agricultural machineries such as two-wheel hand tillers began to replace buffalo for plowing. In 2005, there were only five hand tillers in use in Tang Krasang and four hand tillers in use in Tranpang Trabek communities. Increasingly, by 2020, there were 90 of these machineries in Tang Krasang, whereas 71 of hand tiller machineries in Tranpang Trabek.



In 2020 to now, the two-wheel hand tiller machineries are being to displace by four-wheel tractors. There were five of these tractors in Tang Krasang and there were eightfour-wheel tractors in Trapang Trabak communities where most of farmers use theses tractors for dry season rice. The farmers used the four wheel-tractors to prepare land, sawrice-seeds and harvest rice.

Most of farmers now are favor with the four-wheel tractor because the tractors aresuperior for plowing paddy with a hard soil and expending area of the upland rice paddy fast and easier. The speed of using of four- wheel tractor is much faster than using two- wheel hand tillers. As the four-wheel tractor can plow one hectare per hour faster, while the use of the two-wheel tillers can plow one hectare for three to four hours. In 2020 and 2021, farmers in Trapang Trabek, adopted to broadcasting machines. Two vehicles hand tillers commonly use to prepare the land to plant sweet potatoes and mobile water pumps and to pull small carts for transport all agricultural commodity from villages to the markets.

A number of interacting factors appear to drive process of mechanization such as a shift from subsistence production of rice for families for the food consumption and for a sale to markets. The result from the study show that farmers keeps 50% of rice production for their annual consumption. About 40% of rice for sale in the market and there is only 20% for rice seeds. There is an off-farm employment significantly raised from the farmersto invest in agricultural machines and support to their families. The study shows farmers in communities migrate from their village to work at the garment factories and their remittances have enable them to buy more agricultural machineries and accelerated the process of rice growing and other seasonal cash crops and raising the domestic animal, upgrading their houses.

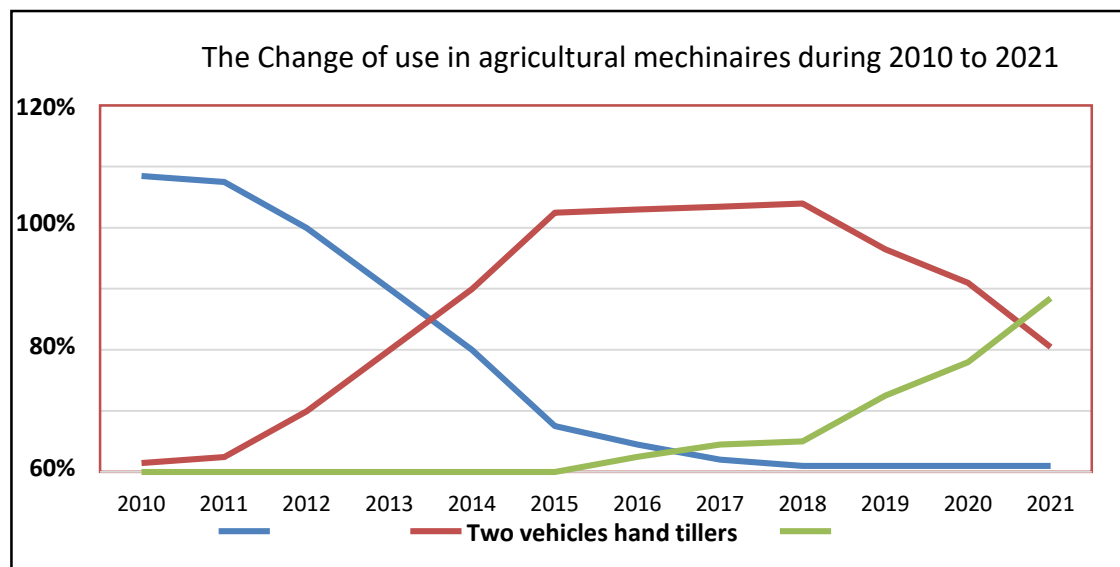
However, some farmers figured out that rural-urban migration has led to loss theirfamily members in rice cultivating, due to remittances from off-farm employments make a higher income. As a result, there is shortage of rice labor in communities, and only elderfarmers who live in the villages to do rice farming, taking care of children, where their parents migrate to out of the villages in the cities and oversea for short and long period oftimes.

Farmers point out that the use of machinery is demanded by rice field size, type ofcrop under cultivation and the geographical zone of rice farm. The study shows about 95% of farmers in the communities grow rice used agricultural machineries such tractors, handtillers or harvesters, whereas 5% only a few family farmers who have small plot of farm land do not use the machineries.



The figure (2) presents the change of use in agricultural machineries during the last ten years. In early 2010, farmers used buffaloes for rice farming activities, but since mid of 2010 up to present, the animal used as labor declined gradually due to the change of farmers behavior from growing rice for home-consumption to sell in market for demand of materials, housing upgrading and transports such as buying motors.

Figure (2) shows the trend of use agricultural machineries during the last ten years.



Source: Fieldwork, 2021.

From last of 2015, the use of buffaloes has almost no longer used. The figure shows from 2018 to 2021 buffaloes are still using for rice cultivating for small plot of farmland to transport rice seeding. In figure, blue line has decreased dramatically almost zero percent in rice farming practices.

For two vehicle hand tillers started to replace the animal labors increasing gradually more from 2012 onward, which presents in red line. The red line goes up from 2010 to 2015, most of farmers are in used the two vehicle hand tillers in approximately 85%. From 2018 to 2021, most of the farmers are both in communities used two vehicle hand tillers for rice cultivation goes down. Until now, interviewed farmers in Tang Krasang, are favors to use hand tillers for their small plot of rice as cost of using this machines are cheaper than tractors.



From 2015, figure shows the trend of tractors use in rice cultivation in both communities grow up. As a result, in 2016 in both communities used tractors only 5% of total 15 tractors are found in Trapang Trabek, whereas there were only five in used in Tang Krasang. Gradually, farmers used tractors approximately 60% in 2021 and this trend is continually to use onward.

In contract, the two vehicle hand tillers dramatically decreased for rice growing. However, according to focus group discussion showed that most of farmers changed the use of two vehicles hand tillers from rice cultivation to use in transport agricultural commodities and converted to be pumping water to irrigate water for dry rice season rice.

### ✓ **Chemical Fertilizer and Pesticide Uses**

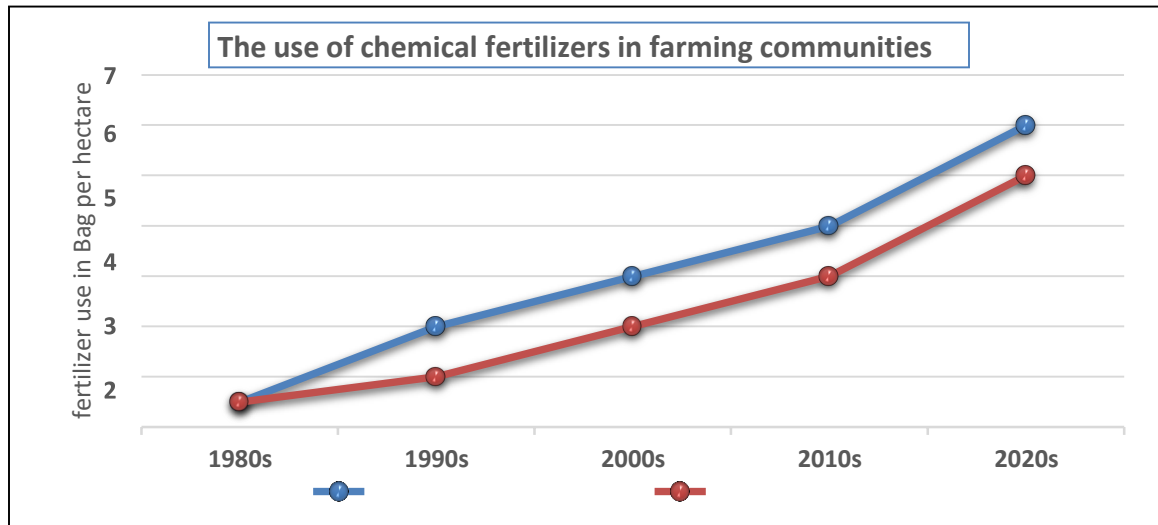
Farmers used heavier chemical fertilizers and pesticide to stabilize of rice yield increasingly. In early 1980s, farmers used one bag of chemical fertilizer per hectare. In early 2002, farmers increased using chemical fertilizers and pesticide was two to three bags to get four tons of rice per hectare. With satisfactory rice yield increase, farmers used six bags of chemical fertilizers per hectare by 2017. With heavier chemical fertilizers, there give a yield of six to seven tones per hectare in dry season rice.

The use of chemical fertilizer has a positive with food security and get high rice yield to large quantity of food secure for their family consumption and for sale to the market. Yet, the overuse of chemical fertilizers resulted in soils become harder and no fertility, however; without the use chemical fertilizers for rice, it was no yield and lost their income.

According to rice policy promotion and export of milled rice in mid-2010, figured higher quantities of imported fertilizers from two main countries as Vietnam and Thailand. In communities, there are three types of chemical fertilizers used, which imported from the neighboring countries.

Pesticides are imported and farmers consumed in their rice crops has increased over the years, especially in dry season rice cultivation. Study indicates more than thousand liters of 20 different kinds of pesticides are used per season.

Figure (3) trend of the use of chemical fertilizers in farming communities



Source: Fieldwork, 2021.

The figure (3) shows the trend of the use of chemical fertilizers of communities for their rice paddy in Tang Krasang and Trapang Trabek. The study shows that there are different types of the chemical fertilizers are being used such as Urea (46-0-0), namely black buffalo head, which is made in Vietnam, while-urea (49-0-0), which is made in Thailand and the Sunrise chemical fertilizer, which is made in Japan.

The farmers started to use the chemical fertilizers in 1990s was small amount, for instance, it was half of bag or one bag of chemical fertilizers. At the time, the farmland soil was good fertility and gave a good rice yield. Gradually, the paddy rice soil become infertile or poor soil, which given the low yield of rice production. Since then, the farmers favored very much to increase apply the chemical fertilizer in order to increase rice production, from two to three bags of fertilizers per hectare of their rice field.

The use of chemical fertilizers are increasing year to year, especially in the last ten years, farmer are heavier using the chemical fertilizers up to 6 bags for high rice yield with around 6 tons per hectare. The farmers concerns with high amount of using the chemical fertilizers that cause destroy the soil and the cost of fertilizer is costly, a bag of fertilizer is 120,000 riels equal to 30 USD.



The figure (3) of chemical fertilizer distribution process show that most of chemical fertilizers are imported. The importers have to register at Ministry of industry, handicraft and enterprise, to get the license to distribute the fertilizers. The distribution flow to provincial distributors/wholesalers and mobile distributors to put the fertilizers in its brands at province, district and center markets as plays in roles of retailers.

The retailers sell the fertilizers to farmers in cash flow or in credit flow. In cash payment, farmers buy fertilizers from the retailers who are villagers living in the same village with the total amount of cash directly. For the credit flow, it means that the farmers purchase the fertilizers from the retailer in advance, after their harvest rice, the farmers have to repay or convert from rice is pricing to equal of pricing of the chemical fertilizers.

### ✓ **Institutional Process in Irrigation Systems**

Tang Krasang and Trapang Trabek rice farming communities has partially existed in irrigation systems, which diverts water from this Stung Chreybak stream to irrigate their rice paddy. Farmer Water User Groups (FWUGs) has elected from villagers who are members of the community to manage water allocation and controlling to irrigation system. The FWUGs has recognized by local authorities. For instance, the Tang Krasang dry season rice cultivation has received financial and technical support for dry season rice demonstration to help farmers to adopt new and better varieties to rehabilitate the canals and to restore reservoir in recent years.

Additionally, the Provincial Department of Agriculture (PDA) in Kampong Chhnang, has supported FWUGs by providing agriculture extension services and by encouraging the farmers to practice agriculture intensification by cultivating varieties of rice such as Jasmine and Sen Pidol and Phka Romdul.

Most of the farmers at household level has adapted dynamic rice-based practices, because due to the change in rainfall pattern and its distribution for rice cultivating. The increased dry spell duration with rainfall is less. It leads to increase risk of drought affected dry rice season production. A widespread adoption of high-yield, non-photoperiod sensitive, short-term rice varieties (three month of rice cycle), required more inputs, new technologies, chemical fertilizers and pesticides.



The rice variety as Phka Romdul and Jasmines full applied in dry season rice in both communities intensively, which have introduced since 2010s to present time. For plots located within the areas of irrigation in communities, farmers are usually able to double/triple the annual harvest by cultivating dry season rice. Nevertheless, in 2018-2019, dry season rice allowed only one time, due to severely drought and governmental policy to store water in lake or reservoirs for domestic consumption.

In Tang Krasang, the farmers try to cultivate early wet season short-term rice with supplemental water available in irrigation system. Additionally, in a limited area of approximately 300 to 350 ha, farmers cultivate a dry season irrigated rice only. In Trapang Trabek, rice cultivation is in the Tonlesap floodplain with a focus on dry season rice.

Dry season rice cultivation starts in early December and latest until late March or April, when water recess to Tonlesap lake. Most farmers now grow hybrid rice varieties, Sen Pidor, Khka Romdul and Jasmines that are suitable for this recession agriculture. These rice varieties provide 6 tons of rice per hectare.

#### ✓ **Cultural Value and Social Relation**

Cultural value and social relation is Cambodia's long history of religion, which has been a major source of cultural inspiration a good of community's wellbeing. However, in the past few decades, the culture and religion has changed because of many factors driven such as new phenomena's of social and political changes, free market force commodity completion, materialization, urbanization and globalization.

The study shows that approximately 98% of the farmers in the communities hold the religion as Buddhism. The results from interviewed shows that four families in Tang Krasang village hold region as Christian. It because of the families who have their members have employed and worked with the local non-governmental organization called "World Vision Organization". Whereas, there are two families living in Tranpang Trabek, hold region as Muslim.



Since 2010s, the cultural value performance have changed. Most of young farmers engaged themselves in free markets, new life styles and materialization. The young farmers involved in garment factories at provincial town and oversea migration. Migrants send the remittances to their family to buy agricultural inputs, upgrading houses and take care of kids.

Young adults changed their behavior, lifestyles and adopted to modern city life, then when they come to visit their home families, started to drink alcoholic, vines and eating and fighting each other in parties or celebration such wedding in communities.

Elders of farmers in villages started to get different kinds of diabetes diseases, blood pressure and overweight for young children. Drugs and traffic-related death and injuries happened due to rural roads have been upgraded by provincial department rural development and military construction unit since 2015.

From 1980 to 1993, social relationship, cultural value, traditional performance was still a good maintaining such as villagers have shared their labors in rice harvesting, collecting crops, upgrading and building new houses and organizing gathering parties in village and pagoda voluntarily.

Since late of the 1993, these events shifted into isolated activities, for example, the study shows that the social relationship and cultural value including solidarity, relationship and cultural and social performance has gradually disappeared. It is due to many internal and external factors to push these changes happened for instance, promoting private investments, rural-urban integration, commercialization, and globalization.

Most of farmers have mobile phones, calling to the markets for sale of their agricultural commodities and buying agricultural inputs are faster and easier. In addition, mobile phone makes closely stay in touch and receive notifications for social events. Regarding to natural resources that main source of income for most farmers in the communities, which have been exploited.

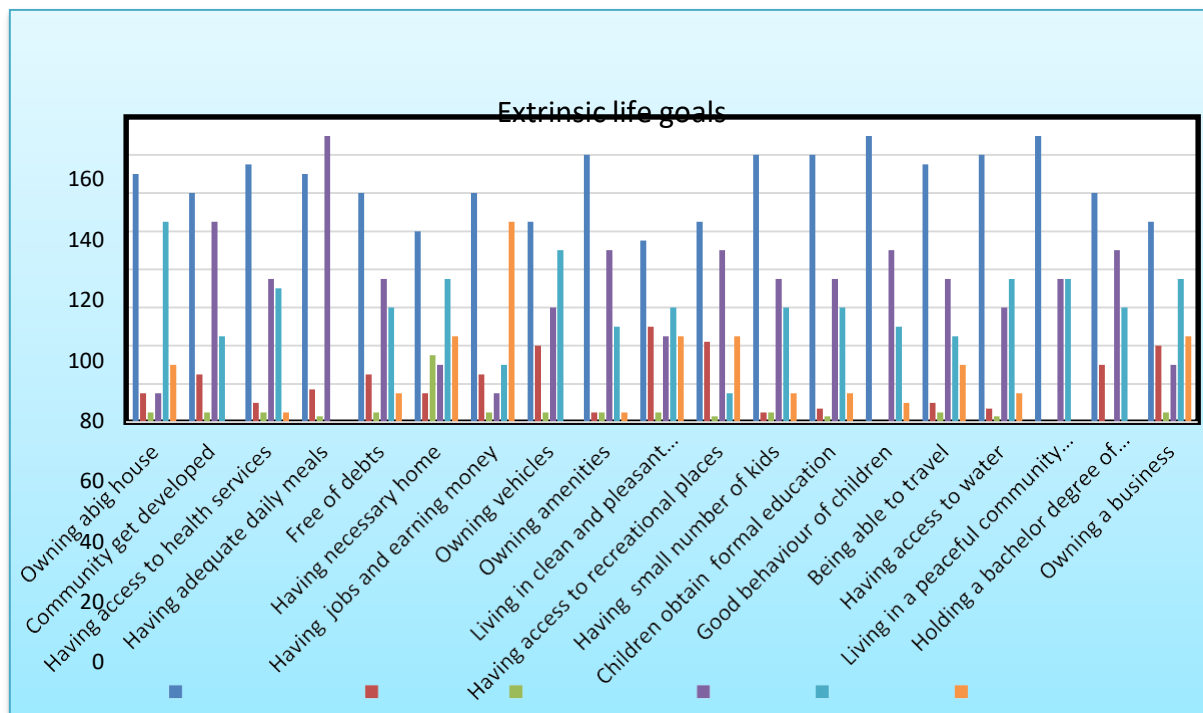
For instance, overuse of forest resource in upstream, fishery in Tonle Sap Lake has declined and other mining resources have started to use by private companies. Water is a key of rice farming for communities, there are some conflict of water allocation among farmers for rice cultivating, especially dry season rice in communities has occurred.

The study analysis change of life goals importance and completion level of subjective wellbeing, with employed questionnaires survey by using the descriptivestatistic coding in purpose of life goals importance such very important, moderate and notimportant and completion level fulfilled, moderate and not fulfil with 19 items.

The results from show in figure (4) change of life goad importance of subjective well-being. The change in life goals of farmers in communities is different. Most of respondents on 19 items survey on level of importance, replied very importance as 87% (100-140) and moderate is about 12% (10-25), whereas not importance is 2% (2-5) of totaln: 150 sample sizes that interviewed farmers.

Result from completion level shows that the fulfilled is 37%, and moderate is 38%,it is because most farmers believe that they can complete their goal of life, whereas only 25% of farmers are not fulfil, as they do not expect that they will do their good job in futureas they become older.

Figure (4) Change in life goal importance of subjective well-being



Source: Fieldwork, 2021



#### 4. CONCLUSION

Rice community transformation is in progress to what extents to present and satisfy farmer's livelihood improvement and change of life goal importance well-being in the communities. Result for the study indicates agricultural intensification are being adopted by most the farmers in communities such as improved rice varieties, chemical fertilizers and pesticide application, rice seed selection and mechanization, respectively. Farmer incomes are significantly associated with various rice production, off-farm income and family members of rural-urban remittances.

It is evident that traditional subsistence-oriented rice growing system has transformed toward private market oriented one links to regional and global markets. Social system in community has changed into complexities toward modern lifestyles and individualization as social norms, solidarity considered to decline in the communities. In an individual 19 items of change life goal shows significantly. The parameters include owning a big house and others shows very importance under the intrinsic life goal.

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