

Participatory Development of Aquaculture Extension Materials and Their Effectiveness in Transfer of Technology: the Case of the AIT Aqua Outreach Programme, Northeast Thailand

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Abstract

AIT Aqua Outreach (AOP) in Northeast Thailand has been engaged in development of technical recommendations and extension approaches for small-scale aquaculture for over 10 years. In the absence of a conventional extension service in the Thai Department of Fisheries, AOP experimented with a distance extension approach, centred on the participatory development of extension materials based upon successful results of on-farm trials. By making these materials appropriate to farmers' lifestyle, culture, language and learning experience, it was hoped that they would be an effective tool for information dissemination. Evidence of surveys on project impact substantiates that hope. Different groups of farmers receiving only materials, only training and both training and materials were surveyed. Over 70% followed recommendations to some degree, with higher levels amongst groups receiving the extension materials. Adoption of pond fertilization was higher than nursing of fingerlings, although most farmers adapted the principle to their own resources. Typical yields were around 250 kg.rai⁻¹ (0.16 ha) higher than before adoption and many farmers spread the knowledge gained to others. Given that over 6,000 sets of the materials have been distributed in Northeast Thailand, an incremental production value of US\$0.5 million annually arising from the recommendations is estimated.

Introduction

The AIT Aqua Outreach Programme (AOP) in Northeast Thailand began in 1988 as an adaptive research project aimed at developing appropriate technical recommendations for aquaculture for small-scale, non-specialist farmers, through a farming systems research approach. By 1990, the project began to feel confident that it had identified a package of low-cost recommendations which raised yields in earthen ponds by some 300% over the estimated baseline fish production of 60-80 kg. rai⁻¹ (1,600 m²). The project then began to assess ways of disseminating information about this package more widely to a larger number of farmers taking into consideration the resource limitations of its main collaborating partner, the Thai Department of Fisheries (DoF). A SWOT analysis of the social and institutional context for extension revealed that DoF had very few extension officers operating from the provincial level, none of whom had been formally trained in extension techniques. On the other hand, it was dealing with a mobile and literate farm population, and had close links with a number of other Thai government agencies that were represented at the grass-roots

(commune and village) level. AOP thus determined that a 'distance extension' approach relying on the dissemination of information through these non-specialist agencies through mass media might be the answer (Demaine and Turongruang, 1996).

Although it has been the dominant system for over two decades, there are growing doubts about the effectiveness of the conventional Training and Visit System (T and V) as a substantial basis for agricultural extension in developing countries (Farrington 1994). The T and V system was born in the transfer of technology paradigm of extension and involves the passing on of technical messages through a dense network of extension agents working with contact farmers in the villages (Benor and Baxter 1984). T and V systems have been established throughout Asia by a series of World Bank projects, but have proved to be both unsustainable in terms of current expenditure and unable to cope with the complexity of farming systems in resource-poor areas (World Bank 1994). Such systems have also tended to be crop specific, but governments have been reluctant to allow other sectoral departments in fisheries, forestry and livestock to create parallel structures. Thus most fisheries departments find themselves with a minimal complement of extension workers, which mirrors the situation in the crop sector twenty years ago. Most of them are fisheries scientists with no formal training in extension (Melkote 1991). The Thai DoF appears to have been no exception, until recently having a maximum of six extension agents per province (Komolmarl 1992).

In the absence of conventional extension services, one alternative is the use of mass media in the form of leaflets, pamphlets, videos, TV and radio. According to Van Den Ban and Hawkins (1988), "newspapers, magazines, radio and television generally are the least expensive media to carry messages to large numbers of people." While doubts have been cast about their effectiveness in influencing decision-making, as opposed to creating awareness of innovations and stimulating their interest in them, a distinction should be made here between audio-visual and printed materials. These can be complementary in that the former may be used to create awareness, while the latter supply 'a constant reference, as a person can keep a leaflet and refer to it at any time' (MacDonald and Hearle 1984).

Unfortunately many such materials are designed by research scientists working with the staff of centrally located media units, who have little or no contact with farmers. The extension materials usually contain too much information presented in too scientific a format, written in too educated a language for farmers to understand. The Thai DoF Extension Division has used many types of media materials, but these have been made centrally with content deriving from the results of on-station research. The language used for the materials is central Thai, with many technical terms; pretests of the materials were carried out by circulating the materials amongst extensionists in the Division, with no involvement of fish farmers (Lertpradist 1990). During 1987-1991, 42 different extension materials were produced, 31 in printed form, but only 4-5 had content which was suitable for use by small-scale farmers, assuming they could cope with the language and the technical terms (Komolmarl 1992). Not only were the materials of little use to small-scale farmers; farmers who were interested had to collect them from the provincial office.

The AIT AOP has sought to address these problems through a participatory approach to the production of such extension materials.

Design and Development of Extension Materials by AOP

The approach aimed to create greater efficiency in the use of extension materials to transfer technology so that farmers could use extension materials as points of reference in their farm practice. Audio-visual materials and printed materials were used complementarily. The former created awareness and explained where the printed materials could be obtained; the latter offered the details required to follow the recommended practices (Turongruang 1995). In the design of the printed materials in particular, a great detail of attention was paid to making them appropriate to the farmers' lifestyle, culture, language and learning experience. A good deal of this information came from interaction with and observation of farmers during the process of on-farm trials, although topical surveys were also carried out to assess their habits in listening to radio and viewing television.

On the basis of these observations, the basic format of printed materials could be designed. Messages were thus clear, short and sharp, with the point of the message instantly obvious. They were written in straightforward language, using local dialect and with no technical terms. The structure of the message had to be clear and well arranged, while the material had to attract attention, be stimulating to read and, if possible, be entertaining as well. Even the size of print was considered; although most households included members with more recent schooling who could read fluently, most farmers had left school many years previously and were not used to reading. Abstract concepts such as tables were kept to a minimum. Care was also taken that pictures did not convey the wrong message.

To ensure that these principles were followed, the Project developed an iterative design process (Fig. 1). The development of printed materials began with a brainstorming exercise bringing together all project staff who had been involved in the development of technical recommendations and in monitoring the on-farm trials. Extension messages were drafted based upon the information from the on-farm trials, with media professionals instructed by the field team. The media professionals could advise on technical design issues, but could not change the content or specific words. The 'media professionals' mentioned here were local people who were also trained in and took part in field research. Both understood the local Northeast Thai dialect and customs. Here the AOP approach differs considerably from the model of Mody (1991) in which the design professionals take the results of field research and are dominant in the production process.

Once promising extension messages have been developed and initial drafts drawn up, these are field -tested in the same way as the aquaculture technologies. Farmers who had not been involved in the technical trials were briefed at village meetings about the materials and were left to make their own decision about whether to try out the recommendations included in the leaflets. Those who did so were visited regularly by Project staff, with the emphasis on understanding and use of the messages. At the end of the trials, an analysis was carried out on whether anything was missing from the leaflets which caused problems in implementing the technical messages. The success of the materials was evaluated on the basis of the degree to which the farmers were able to implement the technology.

The promising materials were revised on the basis of the experience of these trials and a further round of evaluation by another representative group of farmers — this time without conducting the actual trials — was made. In this case, materials were left with the farmers for a few days for study and comment. Only when this further evaluation appeared positive were the materials moved to production and distribution. Great care was taken in the

selection of farmers to take part in the evaluation process on the basis on age, level of literacy, level of education, main occupation and gender, ensuring that the group contained no government officials or people with members in the family with higher education. Care taken at this point would ensure that messages could be transferred from farmer to farmer and overcome some of the concerns about the atypicality of contact farmers in the T and V process.

The process of materials development is a lengthy one. On the basis of the experience of on-farm trials in year 1, extension materials are drafted in year 2 for testing with trialists who do not receive the same degree of technical monitoring from project staff. Revised materials are then re-evaluated without trials by a further group of farmers before finalization and distribution in a third year. This process may be unnecessarily long and efforts have been made to refine and shorten it since the initial round of experimentation. The Project has introduced a pre-test procedure which involves trialist farmers directly in the design of the initial materials and their evaluation without further on-farm with a separate group. Specifically Project staff:

- test pictures alone to measure attention, first impressions and understanding
- read the text associated with the pictures to farmers; and
- interview them for their comments and suggestions.

This direct involvement of trialist farmers with extension and media staff has been tried successfully in the development of booklets and leaflets with the DOF Extension Division in Thailand and with DOF in Cambodia (Gregory *et al.* 1996)

Effectiveness of the Extension Materials

AOP has conducted several studies to evaluate the use of media materials produced through this approach. The first of these specifically addressed the extension system, including the materials, by distributing the latter through non-specialist channels (schools, health centres, the agricultural bank, the general agricultural extension service) in two districts of Udon Thani province not involved in the on-farm trials in 1992-93. The results of this 'extension experiment' by the project and by the DoF in three provinces of the region are presented elsewhere (Demaine *et al.* 1994a; Demaine and Turongruang 1996).

A more comprehensive evaluation of project materials has been underway since 1996 as the AOP has sought to assess its wider impact in Northeast Thailand. Over a period of 6 years since their initial testing, the AOP extension materials have been distributed widely to other organizations, not only the close collaborators in Phase II, the DoF and the Department of Vocational Education (DOVE), but also to NGOs, other development projects and individual farmers. Many of the materials have been distributed alongside training programmes, some of them conducted by government departments, some by NGOs, some independently, some in collaboration with Project staff. AOP has sought to find out how far such organizations have used the materials distributed, the degree to which farm households have taken up the technology and the benefit gained. Unfortunately the spread has been wide geographically and it has been difficult to obtain information about distribution from some of the organizations. NGOs in particular have changed personnel several times, leading to a loss in institutional memory.

For that reason, the AOP's evaluation has concentrated mainly on groups contacted by its main collaborators. Analysis of the contacts of these agencies reveals that

there have been three different groups in receipt of AOP technical recommendations:

- those who came to get extension materials from the Project itself from the DoF themselves and did not receive any training (49 cases)
- those who received training and also got extension materials during the training (107 cases)
- those who received training, but were not given extension materials (26)

This breakdown has enabled AOP to evaluate whether the materials are effective in their own right or whether they are better used supported by training, as suggested by some farmers in the initial extension experiment evaluation (Demaine *et al.*, 1994a).

Results

Source of Recommendations

Farmers who had not received training were asked details of their source of knowledge of Project extension materials. Of the 49 farmers in this category, over half had been told by the officers of the DoF, with almost 25% finding out from the radio. Most (65%) then went to seek out themselves, while 20% got them by post after writing letters to the Project office. Others asked friends to collect the materials for them.

Almost all farmers obtaining the materials, both in the course of training and through other means had received all three booklets concerning the three recommendations: hapa nursing (advanced nursing of fingerlings from 2-3cm to 6-8cm using a mixture of rice bran and livestock feed concentrate), making green water (fertilizing ponds with buffalo manure supplemented with urea to produce phytoplankton) and the practice of polyculture (herbivorous and omnivorous species of fish low in the food chain).

The 133 farmers receiving training had received their information about the training from two main sources: DoF officers (30%) and from village and commune leaders (exactly 50% of all cases). A minor source of information (10%) was commune level agricultural extension officers. Most farmers entered the training with a view to receiving more information about fish culture, but a significant minority claimed that they had been told to do so by, or went as a substitute for, somebody else. Around 12% were expecting to receive free fish seed through the training.

Understanding of Leaflets

Almost every one of the 156 farmers receiving the extension materials had read them and almost everybody claimed to have understood what they had read. Of the four cases not understanding, two said they were not sure about fish feed for nursing, while the two others did not understand the steps in making green water and in nursing. Most farmers saw benefit in the materials: to increase their ability to rear fish by themselves; to increase knowledge in general; and to enable them to advise other farmers. Over half of those receiving materials still had the full set for reference and most had retained at least part of the set.

Use of Recommendations

Of these 182 farmers, 164 actually had fishponds so that they were in the position to put the training / information to use. The distribution by group is set out in Table 1.

Table 1. Number of farmers surveyed who owned a pond by group (figures in parentheses are percentages)

Group	With pond	Without pond	Total
Only materials	44 (89.7)	5	49
Training/materials	98 (91.6)	9	107
Only training	22 (84.6)	4	26
Total	164 (90.1)	18	182

Of the 164 farmers with a pond, the adoption of project recommendations by group is set out in Table 2.

Table 2. Number of farmers with a pond adopting recommendations (figures in parentheses are percentages of each group).

Group	Did not follow	Green water only	Hapa nursing only	Both	Total
Only materials	9 (20.4)	16 (36.4)	6 (13.6)	13 (29.5)	44
Training/materials	21 (21.4)	29 (29.6)	9 (9.2)	39 (39.8)	98
Only training	12 (54.5)	2 (9.1)	3 (13.6)	5 (22.7)	22
Total	42 (25.6)	47 (28.7)	18 (11.0)	57 (34.8)	164

Thus over 70% followed recommendations to some degree, although the proportion was much higher amongst those who had received materials than amongst those only receiving training. In total, 63.5% of all farmers with a pond adopted the green water recommendation, while 45.8% followed the nursing recommendation.

Adoption of recommendations usually means the use of the technology for more than one year. The average length of time that farmers had been following recommendations when surveyed in late 1996 is presented in Table 3.

Table 3. Length of time farmers had adopted the recommendations.

Recommendations /Group	Only materials		Training and materials		Only training	
	Years following	Farmers (number)	Years following	Farmers (number)	Years following	Farmers (number)
Green water	2.67	15	2.52	27	0.67	3
Hapa nursing	2.05	6	2.19	9	1.88	2
Both		14		39		5
Total		35		75		10

Nursing

Before receiving information from the Project, only 6 households (3.7%) had previously nursed fingerlings, with no major differences between the three groups. Of these two were relatives of fisheries officers, while the remainder had obtained information elsewhere.

Of those farmers with a pond who rejected the recommendation without trial (89 cases), 21.3% (mainly those who had received both training and materials) said that it was unnecessary since they already stocked large fingerlings and/or dried and prepared their ponds and three other farmers nursed fingerlings in cement or earth ponds without a hapa. Arguably this group had accepted the principle of nursing and their answers did not indicate outright rejection. However, 24.7% indicated that their pond was unsuitable for nursing; 13.5% answered that they only reared fish for consumption, apparently having enough to eat without improving their system; 10.1% claimed lack of labour; 6.7% lack of capital; and another 6.7% were engaged in more profitable business. Clearly these people totalling one-third of all farmers with ponds regarded the technology as unsuitable for their system. A rather disproportionate proportion of these rejecters came from the group only receiving materials. Another four farmers from this group said that they did not understand the materials.

Among the group of farmers trying out the technology, the length of time they had adopted the innovation ranged from 1 –5 years, with 49.3% of the 75 farmers adopting having tested it for only one year. Only 20 farmers had nursed fish every year after adopting, while as many as 46.7% had given up after a single year (Table 4). The table suggests that farmers receiving training were more likely to use the technology every year, or from time to time, than those who were only receiving materials.

Table 4. Regularity of use of the nursing recommendation (figures in parentheses are percentages of each group).

	Materials only	Materials/training	Training only	Total
Every year	3 (15.8)	14 (29.2)	3 (37.5)	20 (26.7)
Some years	4 (21.1)	14 (29.2)	2 (25.0)	20 (26.7)
Only first year	12 (63.0)	20 (41.7)	3 (37.5)	35 (49.3)
Total	19	48	8	75

Reasons for discontinuance which do not indicate a total rejection of the technology included the fact that the farmers had not restocked, having sufficient fish in the pond (22.6%), or that they had prepared the pond and released large fingerlings (15.1%). However, a further 15.1% indicated that the innovation was ineffective, 13.2% said they had insufficient labour and 9.4% said that the technology was not suitable for their pond system (conceivably too shallow or easily flooded). These could be construed as rejection of the technology, as could the reply of 17% of farmers who said that they had other enterprises that offered a better return.

Pond Fertilization

Fertilization was practised by significant numbers of farmers (14.6%) prior to their exposure to Project recommendations. Half of these had used only animal manure and a further quarter compost, consisting of animal manure and vegetable matter. Only four farmers had used chemical fertilizer. The introduction of inorganic fertilization in the region is thus closely linked to the AOP and the fact that over 60% of pond owners adopted this recommendation (Table 2) is a particular indicator of the success of the Project approach and recommendations.

Of the 60 farmers who did not adopt the green water recommendation (Table 2), 18.3% were not actually culturing fish, but merely trapping wild fish. Arguably this group can be excluded from the analysis. Almost a quarter, however, said that their ponds were not suitable, probably indicating a too open system to make fertilization effective. Another 15% said that they were too busy with other enterprises, 8.3% claimed lack of capital and 13.3% appeared to be satisfied with their existing production. More disturbing for the Project was that a similar number said they had not understood the recommendations, the bulk of these among those who had received only training.

Of the 104 farmers taking up the recommendation, the length of time they had followed it ranged from 1-6 years. Although 35.6% had only utilized it for one year, but over 30% had adopted for more than 4 years. Farmers did not adhere to the green water recommendation every year, as indicated in Table 5. As many as 58% of farmers did not fertilise their water every year, although those who had received both training and materials tended to do so more consistently than their colleagues.

Table 5. Regularity of making green water in farmers' ponds (figures in parentheses are percentages of each group).

Group	Did every year	Not every year	Total
Only materials	5	10 (66.7)	15
Training/materials	14	13 (48.1)	27
Only training		3 (100.0)	3
Total	19	26 (57.8)	45

As many as 80.7% of those farmers adopting green water as a single recommendation made changes to the recommendation to suit their systems, indicating that it is not appropriate to be too prescriptive about the technical package (Table 6). Rather it is the principle of the recommendation that matters. In fact 56.7% of those making their pond water green followed the first round Project recommendations of mixing urea with buffalo manure, but quite a number changed the amounts of inputs specified. Others changed the recommendation according to their resources: 14.4% used other animal manures with urea either simply or with some supplementary feed; 22.1% used only animal manure; and 6.7% animal manures with supplementary feed. Among farmers who tried to make water green but did not follow the urea-buffalo manure recommendations, half claimed they did not have sufficient capital to buy urea, while almost all others practised integrated farming with small livestock (pigs or poultry) reared over the pond. This was most common among those who had received both materials and training. Overall those receiving training tended to follow the

package more exactly, while more of those receiving materials tended to use animal manures alone (Table 7).

Table 6. Proportion of farmers making changes to fertilization recommendation (figures in parentheses are group percentages).

Group	Changed recommendation	No change	Total
Only materials	24 (82.7)	5	29
Training/materials	54 (79.4)	14	68
Only training	6 (85.7)	1	7
Total	84 (80.7)	20	104

Table 7. Method of making water green adopted by farmers (number of cases).

	Only materials	Training/materials	Only training	Total
Urea + buffalo manure	12	43	4	59
Urea + buffalo manure + crop wastes	4	1		5
Buffalo manure only	10	11	2	23
Urea and other animal manure	2	7	1	10
Manure + others		2		2
Manure + crop waste	1	4		5
Total	29	68	7	104

Changes in Levels of Production

Farmers were asked about their previous fish production compared to their current production after adopting recommendations. While these are rough estimates, the results of the three groups of farmers in relation to their adoption of the two main recommendations showed significant increases, especially where both recommendations were adopted (Table 8).

Table 8. Estimated levels of fish production before and after using recommendations, in kg. rai⁻¹, 1,600 m² equivalent.

Group /recommendation	Green water only		Hapa nursing only		Both recommendations	
	Before	After	Before	After	Before	After
Only materials	182.7	294.3	202.0	281.5	306.9	538.3
Training/materials	106.7	255.4	207.5	258.3	332.5	550.9
Only training	17.5	15	130.0	1961	58.3	251.2

Asked about the change in production in another way, 55.4% of 101 farmers offering

an opinion said that their production had increased by a large amount and 17.8% by a reasonable amount. A further 16.8% said they had achieved a small increase. Those farmers receiving materials tended to have better results than those receiving training only. Just over half the farmers expressed great satisfaction with this production increase, with another 31% claiming general satisfaction; only 17% said they were not satisfied. Of 122 farmers following recommendations, the vast majority (94.3%) felt that the recommendations were suitable for them; of the remainder, 6 farmers said that their fry had died after nursing.

Farmer-to-farmer Spread of Information

Farmers were asked whether they had spread information on the recommendations to others. Of the total number of 182 farmers (those receiving training, but not having a pond, could have told other people about their experience just as much as those with a pond), slightly under half had passed on the message. Farmers receiving only training were very much less likely to pass on information (Table 9). The availability of written material is clearly a factor in farmer-to-farmer spread of information.

Table 9. Farmer-to farmer spread of information (figures in parentheses are group percentages).

Group/spread	Farmers who spread	Farmers who did not spread	Total
Only materials	28 (57.1)	21	49
Training/materials	59 (55.1)	48	107
Only training	3 (11.5)	23	26
Total	90 (49.5)	92	182

Of those farmers giving information, the average number of fellow farmers contacted is presented in Table 10, although the averages hide the fact that one farmer receiving training claimed to have contacted over 100 others). A total of 624 farmers had been contacted, over three times the number surveyed and on average of over 7 farmers per sample farm.

Table 10. Number of farmers contacted.

Group	Number of farmers contacted	Average number contacted
Only materials	142	5.1
Training/materials	362	6.5
Only training	120	60
Total	624	

Most of the farmers contacting others explained their experience verbally (55%), while smaller numbers (almost 30%) gave their friends the extension materials to read. In a few cases, a village meeting was called to explain the technology or the information was broadcast on the village loudspeaker system.

Conclusions

This study confirms our earlier findings (Demaine *et al.* 1994b) that low-cost technical recommendations, well-tested in field trials can be taken up by farmers without regular extension advice such as is received under a typical T and V framework. More important, carefully designed extension materials, developed in dialogue between farmers and government officers, can be an effective means of extension of technical messages, are more effective than training on its own, and just as effective as when training is given at the same time as the materials are distributed. Perhaps we should qualify this statement to ‘more effective than poor quality training’. It is well known that a good deal of formal training carried out by government agencies is neither well-targeted nor carefully adapted in mode and content to its farmer audience. Government agencies tend to emphasize numbers rather than careful selection of the audience; many trainees are just there “for the ride/beer/*per diem*”. By contrast, farmers who made the conscious effort to seek out the extension media materials themselves may be presumed to be more committed to learning in the first place.

The analysis may also allow some modest speculation about the overall impact of the AOP’s recommendations in Northeast Thailand. Between 50-70% of persons receiving extension materials tried them out and perhaps half continued to use the recommendations regularly or from time to time when the need arose. Between 1991-1995, some 6,000 sets of extension materials were distributed to various groups in the region. Assuming a modest 40% of these materials led to uptake of recommendations, with an average increase in fish production of about 200 kg (in line with the figures in Table 8, but also supported by the evidence from the on-farm trials carried out under the AOP), then the incremental fish production is 480 tonnes annually, valued at Baht 19.2 million (US\$500,000). Since 1996, the Thai DoF alone has distributed a further 6,000 sets of such materials in Northeast Thailand, a figure only limited by budget constraints. Assuming a similar impact, this represents a significant annual increment to production in the region from aquaculture. According to DoF statistics, annual fish production from aquaculture in Northeast Thailand in 1994 was just 16,094 tonnes. (Department of Fisheries, 1996).

What the evidence presented does not indicate is the distribution of benefit. In fact, farmers’ ‘guestimates’ of their fish production prior to the adoption of project recommendations presented in Table 8 appear to be high. This might suggest that the households adopting recommendations as a result of receiving materials, either directly or through training, could be the rather better-off farmers, chosen for training from farmers usually in contact with government and more mobile.

The AOP rapid survey did not address this problem, but a more recent survey both widened the sample and included more evidence of socio-economic status. This survey is of 201 families receiving training or materials from the Department of Fisheries in 1996-97 in the three provinces of Udon Thani, Sakol Nakorn and Nakorn Phanom. Preliminary results show that 74% of households had adopted some part of the technical recommendations. This included 20 out of 28 families who had received information from other farmers. There was little difference in uptake between the groups receiving training only, training and materials and materials only. However, analysis of the socio-economic status of farmers adopting project recommendations in comparison with non-adopters, did show the former to be slightly better off. There were no differences in land holding, with both groups having holdings significantly below the minimum size to make a living from agriculture, but the livestock holdings of adopters were larger and ownership of household assets slightly higher. Comparison of income levels proved to be difficult because lower incomes from agriculture

were offset by off-farm earnings (Demaine *et al.* in preparation).

To address this major problem of targeting by government agencies in their training activities, recent support (training and materials distribution) has been provided to marginal groups in the border areas of Ubol Ratchathani province. Preliminary results show excellent take-up of recommendations and positive results are emerging in fish production, which indicates that use of a mass media approach to aquaculture extension may be relevant for poor, small-scale farming households.

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